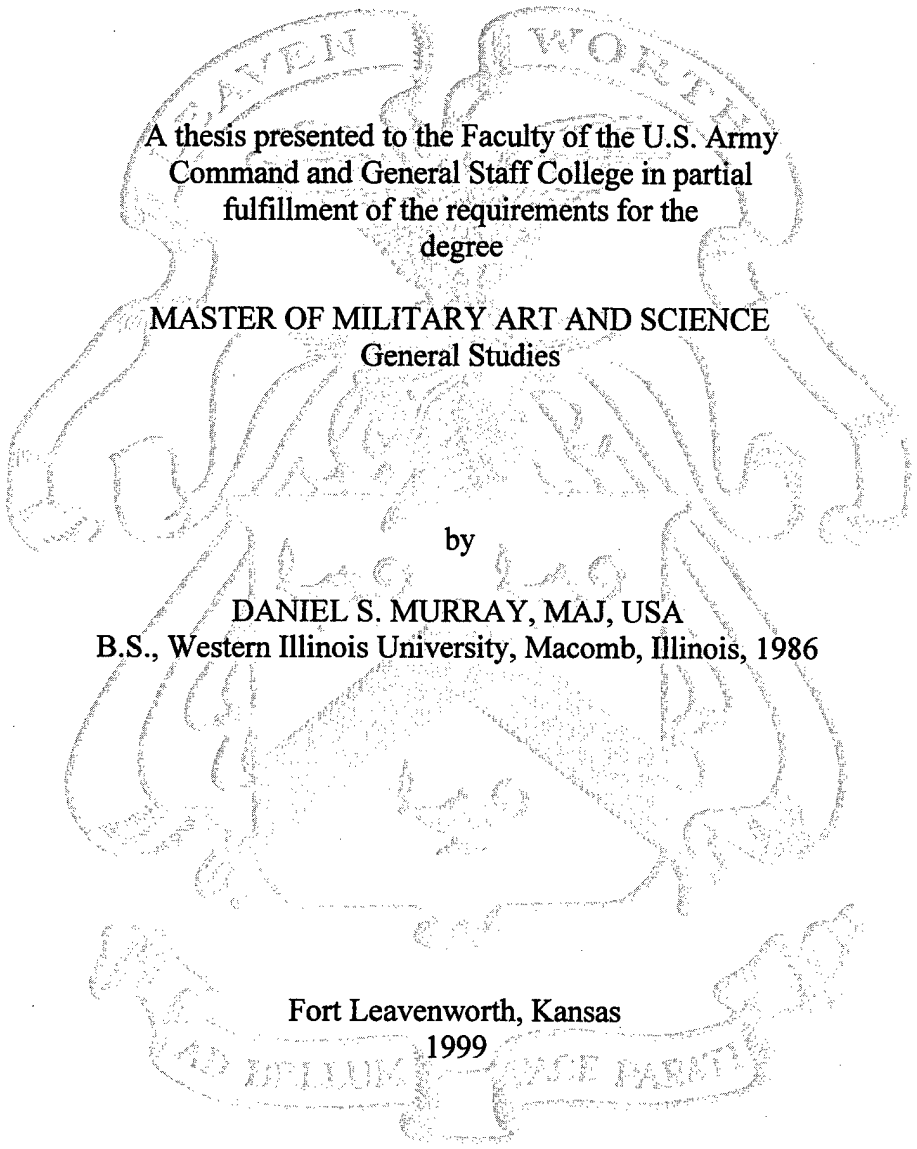
CHEMICAL AND BIOLOGICAL DEFENSE OF PORTS OF DEBARKATION: WHAT ACTIONS ARE BEING TAKEN AND HOW EFFECTIVE ARE THEY?



A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE
General Studies

by

DANIEL S. MURRAY, MAJ, USA
B.S., Western Illinois University, Macomb, Illinois, 1986

Fort Leavenworth, Kansas
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Operation Desert Shield displayed to the world what the U.S. and allied coalition forces could do given six months to flow combat power into ports unopposed. Recent studies commissioned by the Joint Staff concluded that the U.S. military will not have that luxury in the future. This conclusion compels the U.S. to reevaluate its airport and seaport of debarkation (APOD, SPOD) chemical and biological (CB) defense and consequence management strategy. Military analysts believe that a CB strike on the PODs will not rule out U.S. victory as long as the U.S. is willing to endure a prolonged conflict with significant casualties.

This study explains the process needed to avoid paying this unnecessary price. An enemy CB attack on a POD during force projection presents a complex situation that demands significant advance preparation. The CB threat comes in many forms and the threat analysis process must be modified to identify each one. Only then can vulnerabilities be accurately assessed and mitigated. The current battlefield vulnerability analysis process, if applied to PODs, would result in a grossly inaccurate effect analysis. Defending against and recovering from a CB attack in the PODs are paramount for the preservation of U.S. strategy and the lives of U.S. service personnel.

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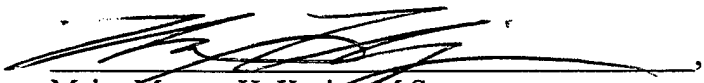

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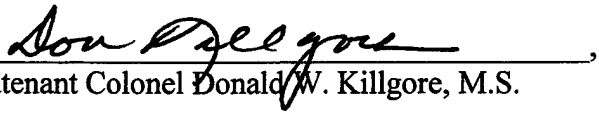

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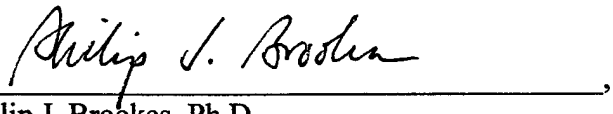

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

CHEMICAL AND BIOLOGICAL DEFENSE OF PORTS OF DEBARKATION: WHAT ACTIONS ARE BEING TAKEN AND HOW EFFECTIVE ARE THEY? by MAJ Daniel S. Murray, USA, 151 pages.

Operation DESERT SHIELD displayed to the world what U.S. and allied forces could do given six months to flow combat power into ports unopposed. Recent studies commissioned by the Joint Staff concluded that the U.S. military will not have that luxury in the future. This conclusion compels the U.S. to reevaluate its airport and seaport of debarkation (APOD, SPOD) chemical and biological (CB) defense and consequence management strategy. Military analysts believe that a CB strike on the PODs will not rule out victory as long as the U.S. is willing to endure a prolonged conflict with significant casualties.

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LIST OF ACRONYMS

AACG	Arrival Airfield Control Group
ABTD	Air Breathing Threat Defense
AMC	Air Mobility Command
AOR	Area of Responsibility
APA	Army Prepositioned Afloat
APOD	Airport of Debarkation
APCC	Aerial Port Control Center
ARCENT	Army Central Command
ASM	Air to Surface Missile
BMC4I	Battle Management and Command-Control-Communications-Computer-Intelligence
BMD	Ballistic Missile Defense
CB	Chemical and Biological
CBIRF	Chemical and Biological Incident Response Force
CINC	Commander in Chief
CM	Cruise Missile
COA	Course of Action
COMMZ	Communications Zone
CONUS	Continental United States
CRAF	Civil Reserve Airfleet
CSH	Combat Support Hospital
CSS	Combat Service Support
DoD	Department of Defense

DS/DS	DESERT SHIELD/DESERT STORM
ECOA	Enemy Course of Action
EOD	Explosive Ordnance Demolition
HN	Host Nation
IPB	Intelligence Preparation of the Battlefield
JFC	Joint Force Commander
JIPB	Joint Intelligence Preparation of the Battlefield
JMETL	Joint Mission Essential Task List
JRA	Joint Rear Area
JRAC	Joint Rear Area Coordinator
JRTOC	Joint Rear Tactical Operations Center
JTBMD	Joint Theater Ballistic Missile Defense
JTMD	Joint Theater Missile Defense
JTTP	Joint Tactics, Techniques, Procedures
MDMP	Military Decision-Making Process
MHE	Material Handling Equipment
MOPP	Mission Oriented Protective Posture
MPS	Military Prepositioned Ship
MSC	Military Sealift Command
MS & R	Military Strike and Raid
MTMC	Military Traffic Management Command
MTW	Major Theater War
NAD	Naval Area Defense

NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NBC JIPB	Nuclear, Biological, and Chemical Joint Intelligence Preparation of the Battlefield
NCFSU	Naval Construction Force Support Unit
NGO	Nongovernmental Organization
NMCB	Naval Mobile Construction Battalion
NTWD	Navy Theater Wide Defense
OPCON	Operational Control
OOTW	Operations Other Than War
PB	Pyriodostigmine Bromide Tablets
PE/PKO	Peace Enforcement/Peacekeeping Operations
POD	Port of Debarkation
POE	Port of Embarkation
Prime BEEF	Prime Base Engineer Emergency Force
RO/RO	Roll On/Roll Off
RSOI	Reception, Staging, Onward Movement, and Integration
SPOD	Seaport of Debarkation
SOF	Special Operations Forces
TAA	Tactical Assembly Area
TAACOM	Theater Area Army Commander
TALCE	Tanker Airlift Control Element
TBM	Theater Ballistic Missile

TBMD	Theater Ballistic Missile Defense
TCF	Tactical Combat Force
THAAD	Theater High Altitude Air Defense
TOC	Tactical Operations Center
TOFM	Theater Opening Force Module
TTBDE	Transportation Terminal Brigade
TPFDD	Time-Phased Force and Deployment Data
TPFDL	Time-Phased Force and Deployment List
UAV	Unmanned Aerial Vehicle
UJTL	Universal Joint Task List
UN	United Nations
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
WMD	Weapons of Mass Destruction

CHAPTER 1

THE THREAT ENVIRONMENT

Introduction

Joint Vision 2010 describes the necessity to project power to crisis areas in rapid fashion. *The National Military Strategy of the United States of America* relies upon the access to strategic ports for the introduction of troops and equipment into theater. Do forces within the threat environment really pose a threat to U.S. power projection? Consider this:

> Preparations for receipt of the heavy brigade from CONUS were underway. . . . At about 0800, as the work shifts were changing, the site learned of "probable" chemical attacks at CONUS airfields. The site commander and the commander of the ARCENT forward element became aware of intensified concerns among the workforce: chemical agents had been used in the U.S.; how long before they would be used here? The contract manager could truthfully say he shared their concern, as he, too, had no protective equipment. The commanders and the contract manager could not ameliorate the growing concern: by noon twenty percent of the workforce could not be accounted for.
>
> At 1000 the following day, the first battalion of the brigade arrived and work took on added intensity. Confidence was returning to the workforce, but the question still arose, "Any word from Washington on issuing us protective equipment?" As the contract manager was concluding an "all hands" meeting, the whole site erupted with explosions. It was apparent as soon as the first person rushed out of the storage bay that it was a chemical attack. The site commander immediately instructed the shop foremen to get into the stocks and issue protective overgarments and masks to everyone at the site. The workers who had remained, about 70 percent of the force, wasted no time in getting the equipment issued.
>
> The site commander and contract manager needed all their persuasive skills to keep them working: now that they had protective gear they had an intensified incentive to make their way south as quickly as possible. The civilian casualties posed another problem: how to get them decontaminated and treated? Clearly there would be no work for a while, and the en route second battalion would likely be diverted to another site. The issue now was how to move the remainder of the equipment south using the available contractor workforce.[1]

This is one of several integrated postulated scenarios considered in the Joint Staff, J8, *Chemical-Biological (CB) 2010 Study*. Potential U.S. adversaries the world over know that U.S. force buildup must be disrupted early and that CB strikes employed in a nonattributable way with minimal casualties will reduce the risk of massive retaliation.[2] The defense of the Korean or Saudi Arabian Peninsulas is dependent upon the rapid deployment and buildup of military forces and combat power prior to the enemy's initiation of full-scale hostilities. In these potential theaters of war, there is a significant chemical threat capable of rendering all seaports and airports untenable prior to or during the introduction of military forces. If this occurs, it will be difficult to defend either peninsula against a rapidly advancing enemy ground army.

This thesis will answer the question, What measures are being taken by the U.S. military to protect against and respond to enemy CB attack on theater airports and seaports before and during force buildup, and how effective are they? Secondly, how does the operational environment shape U.S. actions for planning, protection, and response to enemy CB attack on the ports? Lastly, what have both doctrine and scholars prescribed for planning, protection, and response to enemy CB attack on the ports? A complete and accurate analysis of the threat environment is the underlying factor that determines what actions and counteractions U.S. forces take.

This chapter will discuss delimitations and key terminology pertinent to the thesis question, the environmental framework, the significance of this study, and conclude with the potential for threat employment of CB weapons. The two delimitations are the exclusion of nuclear weapons of mass destruction (WMD) and resourcing the force. In the first delimitation, the exclusion of a nuclear weapon attack on a port, the resulting

hazard is radiation and fallout. While fallout can be brushed and washed from surfaces, radiation cannot be decontaminated.[3]

Preparing to defend against the effects of a nuclear attack is logistically intensive and is effectively accomplished only by units that have access to all of their organic supplies and equipment. A nuclear attack that occurs prior to or during force buildup in a port offers little opportunity for U.S. forces to mitigate the effects of blast and radiation. Simply put, a nuclear attack on a port through which U.S. forces are debarking, absent the protection of an air defense umbrella, would be devastating.

The second delimitation is the adequacy of the force structure. While doctrine is generally supported with the necessary forces to accomplish the mission, answers to the thesis question may determine the requirement for CB defense assets in excess of current capabilities. The analysis required to assess force structure adequacy coupled with the circumstances that may contribute to force inadequacy present a problem far too broad for the scope of this thesis. However, this thesis will propose recommendations that will maximize both U.S. military and host nation assets to accomplish the mission.

Key Terms Defined

The research question is, What measures are being taken by the U.S. Military to protect against and respond to enemy chemical or biological attack on theater airports and seaports before and during force build-up and how effective are they? The key terms are protect, respond, airports and seaports, chemical-biological attack, force buildup, and effective. The term measures refers to procedures of doctrine or emerging doctrine.

A "protected" port is one with an effective air defense umbrella; air-, ground-, and sea-based security to guard against asymmetrical WMD attacks; and with the personnel, equipment, facilities necessary for decontamination, medical treatment, relief from Mission-Oriented Protective Posture (MOPP), and a method for contamination disposal. Briefly, MOPP gear consists of chemical protective clothing and a protective mask. The threat level determines how much, if any, of this equipment is to be worn. The measure of effectiveness for protection is that if the port becomes contaminated, it is only temporarily disabled and the CB attack does not disrupt the strategic flow of forces into the theater.

"Respond" refers to the ability to conduct consequence management by operating the protective and recovery systems in place at the port following an enemy CB attack. This ability is directly linked to the degree of protection in place. A CB attack is defined as the delivery, through any means, of disabling, choking, blister, blood, nerve, or biological agents or toxins with the intent of impeding or stopping the flow of military forces into theater by denying use of strategic port facilities. The measure of effectiveness for respond is that if the port becomes contaminated, equipment and systems are operational and capable of treating casualties, eliminating contamination, and resuming port operations without impacting the theater strategy.

"Theater airports and seaports" are defined as those facilities serving as the primary points of entry into the theater of operations for all forces, equipment, and supplies arriving on strategic lift from the continental U.S., prepositioned afloat, or global stations. These facilities are operated by the host nation personnel and are expected to have little or no nuclear, biological, or chemical (NBC) defense training.

The last piece of the research question, "force buildup," is a product of force projection. The force is defined as the total military and civilian effort already present or deploying to the theater in support of the military strategy. Force buildup is dependent upon the availability and capability of strategic lift and ports. While the U.S. military can exercise positive control over its strategic lift assets, the host nation is in control of the ports.

The theaters to which military forces deploy are defined by the threat and the physical environment's characteristics. The theater commander's operational environment assessment will identify factors critical to CB defense as well as provide the distinction between "austere," "restrictive," and "developed" theaters of operation. This study will consider the full spectrum of conflict including the types of threat and the methods of chemical and biological defense.

The U.S. military, as a power projection force, has responded to crises worldwide over the last several years. Operation DESERT SHIELD/DESERT STORM (DS/DS), Operation RESTORE HOPE, Operation JOINT ENDEAVOR, and Operation UPHOLD DEMOCRACY represent past and current missions representative of the full spectrum of military operations.[4] The range of military operations, from humanitarian to major theater war, presents a number of potential threats to U.S. forces. *The National Military Strategy of the United States* defines these as regional dangers, asymmetric challenges, transnational threats, and wild cards.[5] Regional dangers include regional powers with the desire and the means to challenge the U.S. military.[6] Iran, Iraq, and North Korea are examples. Asymmetric challenges include unconventional approaches designed to bypass strengths, exploit vulnerabilities, or confront the U.S. in ways that cannot be

matched in kind.[7] Acts of terrorism and the use or threat of use of WMD are examples. Transnational dangers are those that transcend national borders and threaten both regional stability and U.S. interests.[8] The Serbian-Kosovar crisis of 1999 is a prime example. Lastly, the wild card can be an unforeseen combination of any of these threats.[9] The potential effect of these threats and their link to WMD is a key component of the commander's operational assessment of the environment.

Protecting the force during initial entry is critical to the success of every operation. Forces are most vulnerable and the success of the mission is at greatest risk during initial entry into a theater of operations where the enemy or threat element possesses WMD.[10] Mitigating the effects of this threat requires the implementation of passive and active defensive measures necessary to deprive the enemy of initiative.[11] The host nation may find itself solely responsible for employing these measures prior to the arrival of U.S. forces.

A key element of passive defense is early warning. An early warning capability is used to shape local readiness postures in theater. In addition to early warning, reducing the effectiveness of enemy targeting, mitigating friendly vulnerability and planning reconstitution are essential to an effective passive defense.[12] Active defense includes multitiered components arrayed in depth to engage and destroy air-, land- and sea-based threats.[13] These can include air defense artillery combined with counterforce operations, such as strategic deep strikes aimed at eliminating enemy capabilities before they can be employed. Effective employment of these principles is complicated in a joint operations environment simply due to the magnitude of interservice coordination and to the uncertainty of the host nation's support and infrastructure.

The Operational Environment Impact on Enemy CB Weapon Employment

The success of joint and multinational operations in the defense of strategic ports from CB attack depends on a solid operational assessment of the conditions, circumstances, and influences within the theater environment. The term "circumstances" refers to joint, multinational, and interagency links (including aspects of forward presence and the aim of the operation); "conditions" refers to the threat and the physical environment; and "influences" refers to the host nation's infrastructure.[14] These three concepts are evaluated on a scale ranging from unformed to mature or benign to complex and are discussed in detail in chapter 2 with regard to their application to the thesis question.

Since the end of DS/DS, the U.S. military has deployed into airports and seaports of varying degrees of infrastructure and host nation support capability in Saudi Arabia, Somalia and Bosnia. The concluding section of the thesis will examine what considerations, whether doctrine or emerging doctrine, can be applied to the CB defense of ports in theaters of varying maturity. By conducting a comprehensive analysis of the region and the threat, theater-level commanders and staffs are able to determine what elements within the operational environment influence the enemy's potential to employ CB weapons. Determining if, when, where, and how the enemy will employ CB weapons allows the commander to address the necessary CB defensive measures to counter the use of such weapons and deprive the enemy of an asymmetric advantage.

Significance of the Study

The 1997 National Military Strategy of the United States mentions the potential for U.S. adversaries to start a conflict when it sees the U.S. as being unable to respond to aggressors in another region.[15] Since the end of Desert Storm, U.S. fighting forces have been involved in forty-two military operations around the world.[16] As U.S. forces become more committed to operations throughout the world, the capability to respond to port CB threats becomes increasingly more difficult. This is significant considering the degree to which the U.S. relies on force projection as the mainstay of national strategy. The national military strategy of shape, respond, and prepare now depends upon strategic agility, overseas presence, power projection, and decisive force to defeat adversaries.[17]

It is the policy of the U.S. to deter threat use of WMD by maintaining a strong and capable military force that is able to deprive the enemy of any advantage gained by the use of such weapons.[18] The national security and national military strategies rely upon deterrence as a basic tool for shaping the international environment. Deterrence is defined simply as the prevention of an unacceptable act by fear of the consequences.[19] Deterrence works for the U.S. when the potential adversary believes he faces a capable and committed force that has demonstrated the ability to employ decisive military power.[20] If the U.S. is committing its military forces to multiple, simultaneous, world-wide operations, the chances of being able to convey an effective deterrence will diminish.

The ability to project sufficient military force enables the U.S. to not only conduct credible deterrence but to also demonstrate a level of resolve and commitment. Force projection also relies upon the availability of strategic lift to move forces into airports and

seaports worldwide. Arguably, ports of debarkation (PODs) are centers of gravity for the U.S. power-projection military. The center of gravity is "the foundation of capability on which everything depends."[21] With U.S. military strategy predicated on force projection, military success depends upon the preservation of strategic lift, the PODs, and the overall capability to deploy forces into theater.

> Seaports are the key nodes in the total distribution system that must be established to ensure the success of a military operation. Historically, 85-95% of unit equipment and sustainment cargo is moved into a theater using sealift and is off-loaded through existing seaports or water terminals. Seaports are absolutely vital to deploying and sustaining a joint force and could be among the initial key objectives seized during a forcible entry. Seaport selection must consider all relevant factors because sustainment will hinge heavily on the seaports effectiveness. Without adequate seaports, a geographical combatant commander's deployment and sustainment concepts may become unsupportable.[22]

Threat forces will prevail if they can identify and destroy their opponent's center of gravity by attacking in decisive fashion. The use or threatened use of CB weapons on the PODs during force projection directly counters the U.S. military by circumventing strengths and exploiting vulnerabilities resulting in the denial of access to critical overseas infrastructure.[23] "Failure to halt an enemy invasion rapidly would make the subsequent campaign to evict enemy forces from captured territory much more difficult, lengthy, and costly. Such failure would also weaken coalition support, undermine U.S. credibility, and increase the risk of [a second] conflict elsewhere."[24]

Defining the Threat

Enemy capabilities arrayed opposite U.S. limitations and vulnerabilities are helpful in defining the threat course of action. The number of nations capable of producing CB weapons is steadily rising, and the potential for their use ranges from

blackmail or acts of terrorism to escalation during conflict or war.[25] The overriding theme of Joint Pub 3-11, *Joint Doctrine for NBC Defense*, is that U.S. forces must be prepared to conduct operations in an NBC environment with minimal degradation under the primary principles of avoidance, protection, and decontamination. Given that the U.S. NBC program is defensive in nature, an understanding of the components and the intentions for employing CB weapons is essential in providing effective protection. "An NBC-capable nation is one that has the capability to produce, acquire, and employ one or more types of WMD to achieve political and military objectives."[26] Therefore, the analysis of threat WMD capabilities must include the systems surrounding the production, acquisition, employment, and types of chemical and biological agents. The production of biological weapons represents a cheaper and less sophisticated alternative to chemical, nuclear, and conventional weapons. The equipment to produce biological agents is commercially available, and the scientific techniques have been widely available for decades. Any country with a pharmaceutical or chemical industry can produce chemical agents. Once an adversary obtains the readily available technology and literature for production, stockpiles can be rapidly produced.

Anticipating the method of CB agent employment enables the theater commander to plan appropriate countermeasures. Ballistic missiles represent one form of delivery. The majority of NBC proliferators view ballistic and cruise missiles as the delivery system of choice due to their long range and ever-increasing accuracy.[27] As alluded to earlier, chemical and biological agents can be delivered from an aircraft as a spray or aerosol. Delivery through bombs and artillery are effective techniques as well. Since missiles, aircraft, bombs, and artillery are employment methods that are traceable through

their signatures they may not be suitable delivery methods for a threat force desiring anonymity.

Terrorist employment of WMD produces devastating results and allows the perpetrator of the strike plausible deniability. The religious cult, AUM Shinrikyo, is alleged to be the perpetrator of the deadly, March 1995, Tokyo subway sarin gas attack. Nearly one dozen people were killed and 5,000 injured by six devices disguised as soft drink cans, briefcases, and other seemingly harmless objects.[28] The definitions for biological and chemical agents are described below:

> A biological threat is the capability of an enemy to plan and deploy a biological material to produce casualties in humans or animals or damage plants or other materials. A biological agent is a microorganism or biological toxin intended to cause disease, injury or death in people, plants, or animals. . . . Delivery systems most commonly generate invisible aerosol clouds presenting inhalation hazards from particles that remain suspended for extensive periods.[29]

> Chemical agents are classified according to their physical state, psychological action, and use. Persistent and non-persistent describe the length of time the delivered agent stays in the area. They are classified according to their effect on the body. . . . [The] six major types are nerve, blood, blister, choking, psychochemical, and irritants.[30]

Some of the countries currently engaged in collusion and proliferation of WMD are North Korea, Iran, Iraq, Libya, and Syria.[31] North Korea is developing a 1,000 kilometer range NODONG ballistic missile capable of employing its chemical (mustard and blister) and biological weapons on troops and facilities throughout the Korean Peninsula and most of Japan.[32] Iran has a wide array of ballistic missiles capable of delivering a host of chemical and biological agents throughout the Gulf.[33] Despite the damage inflicted during the Gulf War and the subsequent United Nations (UN) inspections, Iraq retains the knowledge and equipment (chemical and biological agents,

ballistic missiles) necessary to resume their chemical and biological programs.[34] Both Libya and Syria are producing their own mustard and nerve agents deliverable through short-range ballistic missiles.[35]

In order to counter the sophisticated conventional capabilities of the U.S. military, these threat forces may look to employ a CB weapon for the asymmetry it offers in the form of providing a strategic advantage that can achieve political and military objectives. "In four out of five internationally verified cases of chemical warfare use in recent conflicts, NBC weapons were used early, when other effective [conventional] military options were available."[36] The constraint on U.S. retaliatory capability illustrates a potential asymmetric advantage for enemy use of CB weapons.[37] Air and seaports may become the early targets as enemy forces may feel compelled to use their CB weapons before their capability is destroyed by U.S. preemptive strikes.[38] In past conflicts, ports and airfields were out of enemy range and offered sanctuary for U.S. forces as they built combat power. In the twenty-first century, this sanctuary will disappear and the U.S. force-projection Army will face CB threats immediately upon entry into PODs.[39]

Summary

In the *CB 2010 Study*, enemy employment of CB weapons on strategic ports and airfields "resulted in delays, mispositioning of forces, and severe degradation of optempo."[40] The scenario presented in the study characterized an enemy force employing CB weapons in a multitiered fashion primarily because it was perceived as providing an undeniable asymmetric advantage over superior conventional U.S. forces. *The National Security Strategy* and *The National Military Strategy of the United States*

are based upon the forward deployment and force projection of U.S. forces worldwide to meet crises. Coupled with continuing proliferation, U.S. forces are at risk around the globe to the threats of CB attack. Only by fully understanding the threat and the operational environment can effective defense and consequence management procedures be emplaced.

The following chapters of this thesis will explore what the U.S. military is doing doctrinally to protect and respond to the threat of potential CB attacks at strategic port facilities. Additionally, the ideas from the experts in the field concerning this problem will be explored and, together with doctrine, will be analyzed for effective solutions to the thesis question.

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[1]The Joint Staff, J8, *Assessment of the Impact of Chemical and Biological Weapons on Joint Operations in 2010, The CB 2010 Study* (McLean, VA, Booz•Allen & Hamilton, Inc., 1997), 18 (hereafter cited as *The CB 2010 Study*).

[2]Ibid., 10-11.

[3]Department of the Army, Field Manual 3-4, *NBC Protection* (Washington, DC: U.S. Government Printing Office, 1992), 4-10.

[4]Office of the Chief of Staff, U.S. Army, *United States Army Posture Statement FY 99* (Washington, DC: U.S. Government Printing Office, 1997), 3.

[5]Office of the Chairman of the Joint Chiefs of Staff, *National Military Strategy of the United States of America 1997* (Washington, DC: U.S. Government Printing Office, 1997), 1.

[6]Ibid., 8.

[7]Ibid., 9.

[8]Ibid.

[9]Ibid., 10.

[10]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 3-10.

[11]Ibid., p. 9-0.

[12]Office of the Joint Staff, Joint Pub 3-01.5, *Doctrine for Joint Theater Missile Defense* (Washington, DC: Department of Defense, June 1998), III-4.

[13]Department of The Army, Field Manual 101-5-1, *Operational Terms and Graphics* (Washington, DC: U.S. Government Printing Office, 1997), 1-2.

[14]Department of The Army, Field Manual 100-7, *Decisive Force: The Army In Theater Operations* (Washington, DC: U.S. Government Printing Office, 1995), 2-28.

[15]Office of the Chairman of the Joint Chiefs of Staff, *National Military Strategy of the United States of America 1997* (Washington, DC: U.S. Government Printing Office, 1997), 16 (hereafter cited as *National Military Strategy*).

[16]Department of Defense, *Defense '97 Almanac* (Washington, DC: U.S. Government Printing Office, 1997), 41-42.

[17]*National Military Strategy*, 3.

[18]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for NBC Defense* (Washington, DC: Department of Defense, June 1998), A-C-1.

[19]Department of the Army, Field Manual 101-5-1, *Operational Terms and Graphics* (Washington, DC: U.S. Government Printing Office, 1997), 1-52.

[20]*National Military Strategy*, 2.

[21]Department of the Army, Field Manual 100-7, *Decisive Force: The Army In Theater Operations* (Washington, DC: U.S. Government Printing Office, 1995), 3-1.

[22]Office of the Joint Staff, Joint Pub 4-01.5, *JTTP for Water Terminal Operations* (Washington, DC: Department of Defense, June 1996), vii.

[23]*National Military Strategy*, 9.

[24]Ibid., 16.

[25]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for NBC Defense* (Washington, DC: Department of Defense, June 1998), I-1.

[26]Ibid., I-1.

[27]Institute for National Strategic Studies, *1997 Strategic Assessment, Flashpoints and Force Structure* (Washington, DC: National Defense University, 1997), 136.

[28]California Polytechnic University, *Tokyo Subway Gas Attack, Chemical and Biological Terrorism* (Calpoly University Home Page, June 1996, on-line, accessed 24 Oct 1998); available from http://www.calpoly.edu/~drjones; Internet.

[29]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for NBC Defense* (Washington, DC: Department of Defense, June 1998), II-4, II-5.

[30]Ibid., II-5.

[31]Institute for National Strategic Studies, *1997 Strategic Assessment, Flashpoints and Force Structure* (Washington, DC: National Defense University, 1997), 137.

[32]Ibid., 137-138.

[33]Ibid., 138.

[34]Ibid., 139.

[35]Ibid., 140-141.

[36]Major General Ralph Wooten, Chief, U.S. Army Chemical Corps, "Protecting the Force: The 21st Century Chemical Corps," *Military Review* (September-October 1996), 75.

[37]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for NBC Defense* (Washington, DC: Department of Defense, June 1998), I-3.

[38]Ibid., III-2.

[39]Major General Ralph Wooten, Chief, U.S. Army Chemical Corps, "Protecting the Force: The 21st Century Chemical Corps," *Military Review* (September-October 1996), 76.

[40]*The CB 2010 Study*, 24.

CHAPTER 2

LITERATURE REVIEW

Introduction

Chapter 2 is organized into a review of doctrine, professional theses and monographs, and other government documents and published articles. Within each of these literature subgroups, the review analyzes the credibility, relevance, and significance of the material with respect to the thesis question. Credibility refers to the source background, the quality of the content, and the age of the material. Relevancy is determined by the degree to which the material contributes to answering the components of the thesis question (operational environment; force projection; port operations; chemical and biological threat; and planning, protection, and response to chemical and biological [CB] attack). Support for the thesis, strengths and weaknesses, and prevalent patterns were analyzed to determine the overall significance of the material to the thesis question. There is a large amount of information that is related to the thesis question. However, none of the information translates into specific actions to be implemented for the protection of ports from CB attack either before or during force buildup.

Doctrinal Assessment

Doctrine is a set of fundamental principles that guide the actions of an organization toward the achievement of goals. In the military, it is the universally accepted method of how to conduct war and operations other than war and, thus, is the logical starting point for reviewing current procedures. The goal of doctrine is to meet

challenges facing the military today by providing guidance to deal with the broad range of environments, conditions, and threats to which the military may be exposed.[1] Over the past several years, the multitude of U.S. military deployments have served up opportunities for technological developments and lessons learned relevant to the employment of military forces across the complete range of military operations. The effect of this activity has been the production of comprehensive and up-to-date doctrine. Most of the doctrine reviewed here is dated 1995 or newer, the oldest being dated 1993.

Doctrinal Relevance: The Operational Environment

As the fundamental framework for employing military forces, doctrine provides explanation and guidance on five concepts. These concepts are the theater operational environment, force projection, port operations, chemical and biological (CB) attack, and the measures that U.S. military leaders can take to plan for, protect from, and respond to enemy CB attack in the ports. This review illustrates these five concepts and describes how doctrine relates to each.

Determining the state of the operational environment and then examining it within an established framework provides a starting point for nuclear, biological and chemical (NBC) defense analysis. Army Field Manual 100-5, *Operations*, describes the operational environment in terms of peacetime, conflict, and war (see figure 1).[2] Within those three environments, there exists "the range of military operations" also depicted in figure 1. During peacetime, conflict, and war, NBC threats can materialize in both non-combat and combat operations ranging from nation assistance to peacekeeping and peace

STATES OF THE ENVIRONMENT	GOAL	MILITARY OPERATIONS	EXAMPLES
WAR	Fight and Win	WAR (COMBAT)	•Large Scale combat operations •Attack •Defend
CONFLICT	Deter War and Resolve Conflict	OTHER THAN WAR (COMBAT)	•Strikes and Raids •Peace Enforcement •Support to Insurgency •Antiterrorism •Peacekeeping •NEO
PEACETIME	Promote Peace	OTHER THAN WAR (NONCOMBAT)	•Counterdrug •Disaster Relief •Civil Support •Peace Building •Nation Assistance

The states of peacetime, conflict, and war could all exist at once in a theater commander's strategic environment. He can respond to requirements with a wide range of military operations. Noncombat operations might occur during war, just as some operations other that war might require combat.

Figure 1. The Operational Environment and the Range of Military Operations. Source: Army Field Manual 100-5, *Operations*, p. 1-3.

enforcement, up to major theater war. The environments of conflict and war both present CB threats to U.S. forces. Attempts to coerce, intimidate, or provoke for the recognition of political views are the most likely methods of and motivation for CB delivery through terrorism on U.S, allied or coalition forces.[3] The level of sophistication of the CB weapon employed during conflict or war can vary from simple to complex. In war, CB weapons are expected to be sophisticated enough that their employment challenges U.S. or coalition force protection ability while seeking to create tactical problems of such a magnitude that friendly logistics and battle command systems become severely degraded.[4] Whether in conflict or war, it is at the onset of hostilities that threat forces may employ CB weapons to achieve rapid victory on a strategic scale. After

hostilities are under way, it is theorized that threat forces will employ CB weapons if they believe their use will bring about decisive advantage.[5] However, theorizing that CB weapons may be employed in an unpredictable manner, Army Field Manual 100-5, *Operations*, states that commanders should never assume rationality in the mind of the enemy.[6]

Extracted from Army Field Manual 100-7, *Decisive Force: The Army in Theater Operations*, figure 2 provides a framework for analyzing the operational environment.[7] The operational environment is shaped by circumstances, conditions, and influences that exist in varying degrees across a range defined in general terms as either favorable, unfavorable, or somewhere in between.[8] In the same manner that military leaders and planners analyze the threat, so too must they analyze the three components of the operational environment to determine the requirements for defense from and response to CB attacks.

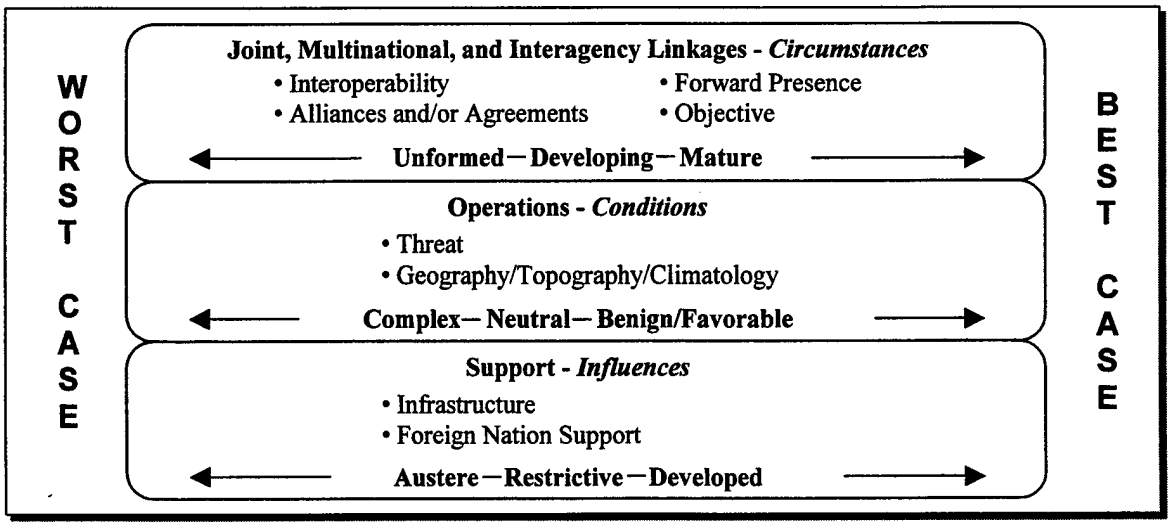

Figure 2. Operational Environment Assessment Model. Source: Army Field Manual 100-7, *Decisive Force: The Army in Theater Operations*, p. 2-28.

Within the circumstances of the operational environment, interoperability and forward presence are key considerations for NBC defense planners. Joint services, government agencies, and other forces must be considered for their NBC defense contributions as part of the overall NBC defense effort. Forward presence is key as it determines the degree to which U.S. forces will enter a theater opposed or unopposed and what NBC defense assets may be prepositioned.

The next component of the operational environment assessment is the conditions. Conditions refer to the threat and the physical environment (geography, topography, and climate). These elements, the threat and the physical environment, link NBC defense strategy directly to threat NBC capability and the battlefield effects on NBC defense. A thorough analysis of all these elements allows planners to tailor forces and prescribe protective measures to respond to and mitigate the effects of enemy CB attack.

The final component of the operational environment assessment model is influences. An analysis of the infrastructure and the host (also referred to as foreign) nation's support capability are key to conducting effective NBC defense planning. Infrastructure capability applies to all fixed installations (airports and seaports, utility systems, road, and rail networks) that will be used for support and control of military forces.[9] It is within this component that planners may find augmentation to NBC protection and response efforts. Host nation support is somewhat of an offshoot of infrastructure in that it includes civilian and military assistance or service present within the theater environment. Examples of host nation infrastructure support that are integral for NBC defense and response include fire-fighting capability, earthmoving, and civil defense.

When NBC defense doctrine discusses fixed-site protection, it defines, within the scope of the theater operational environment, a fixed-site operational environment. Commanders will use the physical, military, civil, and threat environmental parameters when planning and executing fixed-site NBC protection missions.[10] Figure 3 depicts the fixed-site operational environment.[11] The physical environment considers the effects of

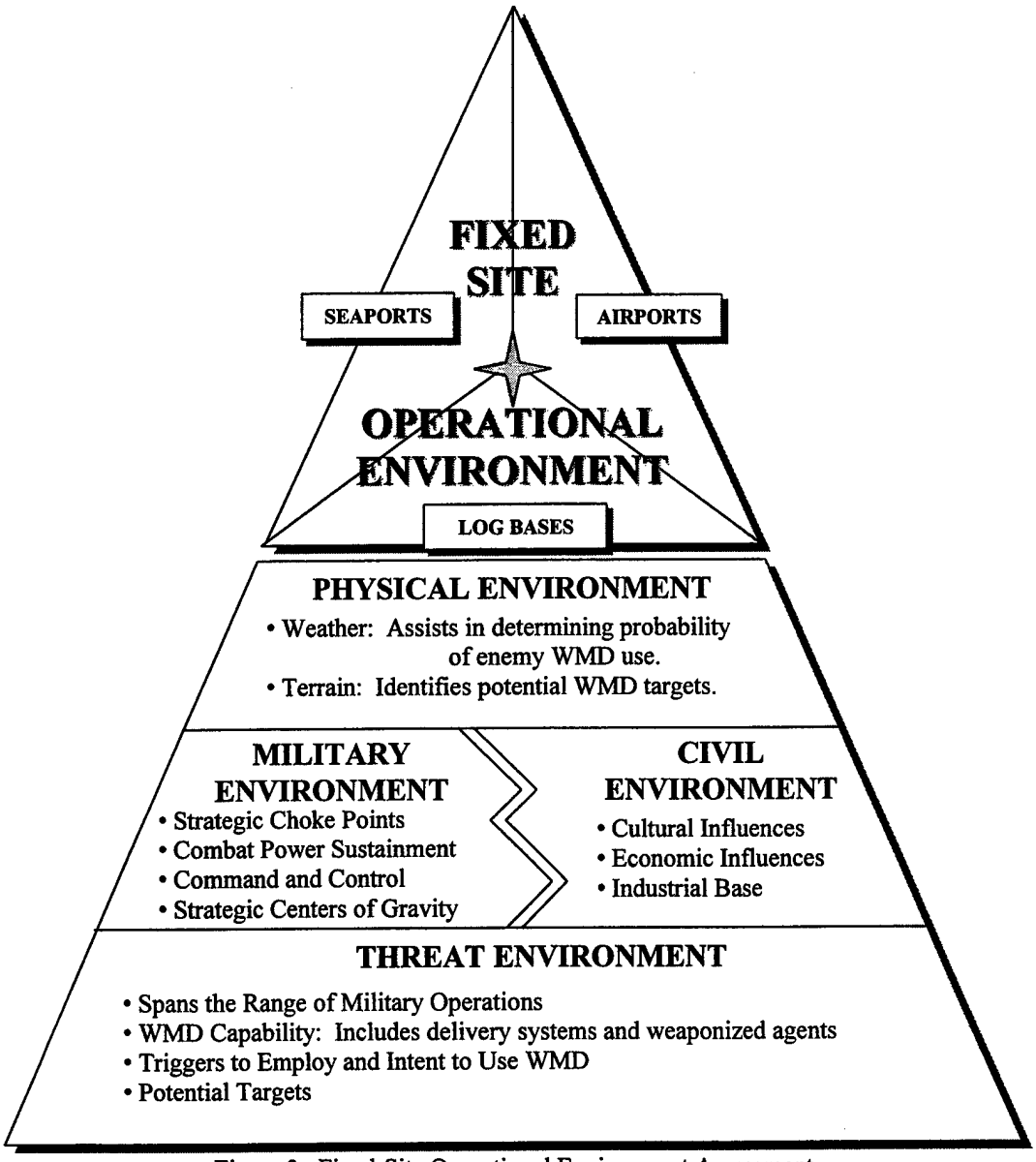

Figure 3. Fixed-Site Operational Environment Assessment

weather and terrain on enemy NBC use and on friendly NBC defense. The military environment discusses the impact of strategic choke points, sustainment operations, complex command and control, and centers of gravity on the U.S. force's vulnerability and NBC defense. The civil environment examines cultural and political influences of the threat nation as they are related to the employment of weapons of mass destruction (WMD). Economic influences, such as the industrial base, gross domestic product, and domestic spending can indicate the threat nation's potential level of WMD sophistication. Lastly, the threat environment is an analysis of known WMD capability, potential targets, and possible employment intentions.

A comparison of figures 1, 2, and 3 shows how the operational environment, the range of military operations, the fixed-site operational environment and the analysis model relate to one another. When NBC defense planners apply the analysis model to the environment and range of operations, they, in essence, complete an intelligence preparation of the battlespace and mission analysis. Understanding and applying these models form the basis for which all military plans, offensive and defensive, will emanate.

Doctrinal Relevance: CB Threat

The central question is, Who has what CB capability and what is their intent to employ CB weapons? Campaign design is determined largely upon how planners answer this question as they conceive the threat in terms of strategic, operational, psychological, and political impacts.[12] The process of intelligence preparation of the battlefield (IPB) establishes that links can be made between specific military operations, enemy threat type, and enemy course of action.[13] Army Field Manual 34-130,

Intelligence Preparation of the Battlefield, outlines distinctly different considerations for defining potential enemy courses of action based upon the type of U.S. military operation being conducted. In any operation, the potential for enemy CB use increases due to continuing proliferation and makes the question, Who has what? and others more difficult to accurately answer. There is little argument that early enemy CB use can cause strategic shifts within the framework of the theater contingency plans. From a combatant commander's perspective, deterrence coupled with active and passive defensive measures can significantly reduce the potential for enemy CB employment.[14]

Chemical doctrine assesses threat CB status in varying degrees. Table 1 explains the Serial 1/2/3 (Green/Amber/Red) characterization of enemy CB capability and employment potential.[15] Arriving at a threat status determination allows the commander to tailor forces for deployment to the proper operational area.[16] Using the threat status estimate, planners have a start point from which to analyze friendly force NBC protective

Table 1. Enemy CB Threat Status

STANAG Serial #	SERIAL 0	SERIAL 1	SERIAL 2	SERIAL 3
Color Code	WHITE	GREEN	AMBER	RED
DEFINITION	•Possesses no CB capabilities at all. •Is not expected to acquire any WMD capability. •Considered highly unlikely for enemy to use CB against US forces.	•Possesses an offensive CB capability. •Has had WMD defensive training. •No indications that CB weapons will be used.	•Possesses an offensive CB capability. •Trained in CB defense. •Delivery systems readily available. •CB weapons have been employed in theater. •Indication says future use is probable.	•Possess agents and delivery systems. •CB defense is equal or better than US forces. •CB weapons have been employed in theater. •Attack is considered imminent.

measures under the doctrinal tenets of protection, contamination avoidance, and decontamination. The process, as explained in Army Field Manual 3-3, *Chemical and Biological Contamination Avoidance*, recommends a mission oriented protective posture (MOPP) analysis and CB vulnerability analysis that considers both military and civilian facilities and personnel over a broad range of circumstances. This results in a multitude of planning recommendations typically characteristic of unit standard operating procedure.

Many threat forces consider chemical weapons an extension of conventional warfare and will employ them to create mass casualties or deny the use of critical facilities, equipment, or terrain.[17] Any country with a pharmaceutical or agricultural research industry can produce chemical and biological weapons.[18] Figure 4 shows the various countries currently seeking offensive WMD capabilities either through their own development or through proliferation.[19] Since CB weapons can be delivered by theater ballistic missile (TBM), smart munitions, or covert devices, the threat environment extends throughout the depth of the battlespace and continues beyond the theater ports and airfields all the way to the force projection base.[20]

Chemical agents are classified as persistent, nonpersistent, and dusty. They are employed, in conjunction with conventional capabilities, to achieve strategic, operational, or tactical objectives in decisive fashion. Persistent agents such as V-series nerve and blister/mustard are used to contaminate terrain, equipment, or facilities advantageous to the opposition. Likely targets include ports and airfields, rear area supply depots, major road networks, and, on the battlefield, defensive strong points.[21] Nonpersistent agents, such as G-series nerve, blood, and choking, are used to hinder, injure or kill troops on the

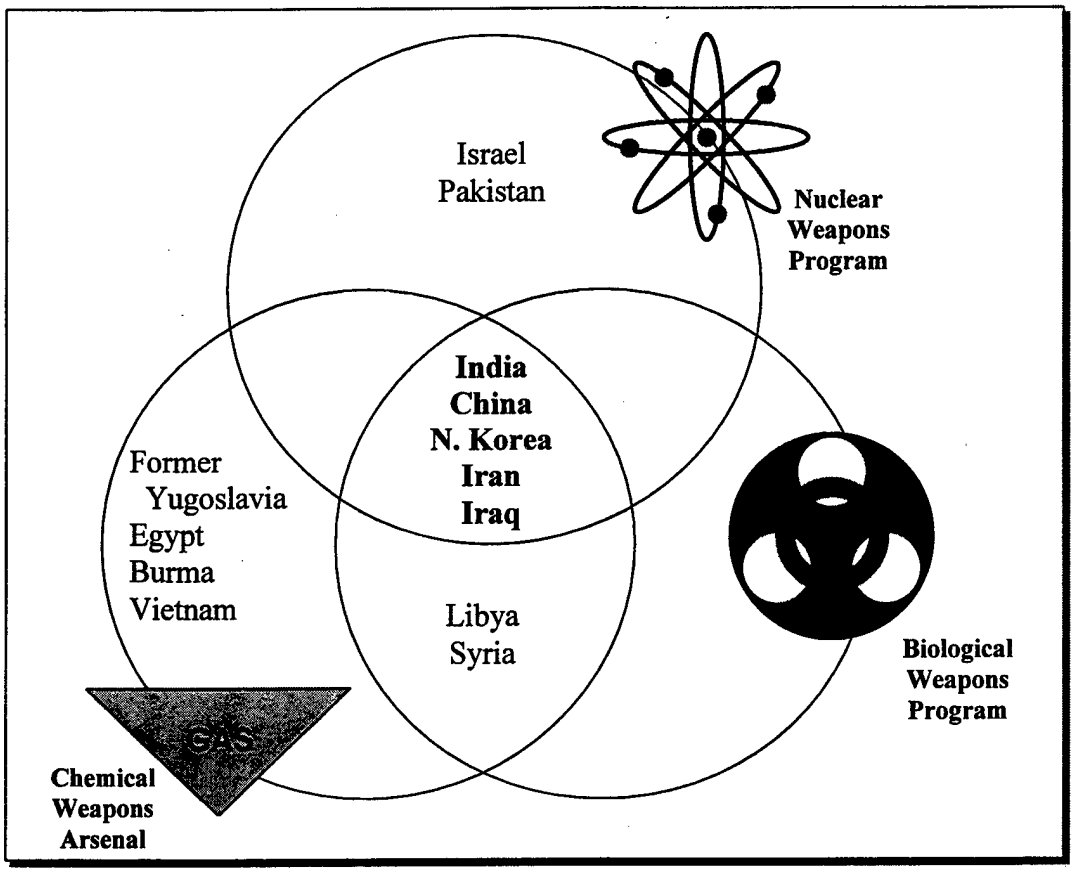

Figure 4. Proliferating WMD Programs. Source: Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, p.1-4.

tactical battlefield prior to an assault.[22] Dusty agents, primarily mustard (HD) and G-series nerve, are impregnated onto a solid and dispersed as an aerosol from an aircraft creating a particularly deadly inhalation hazard.[23] Chemical doctrine offers no particular circumstance or target set for which this type of agent may be used.

Biological agents are classified as pathogens and toxins. Limited detection assets for unprotected personnel make them extremely lethal and can quickly result in mass casualties. Pathogens are infectious agents like bacteria, viruses, and rickettsias (germs) that cause disease by entering through the lungs, digestive tract, skin, and mucous membranes.[24] Toxins are naturally occurring poisonous by-products of pathogens that

can be artificially produced in a laboratory.[25] Neurotoxins, which are fast acting, disrupt nerve impulses resulting in mental confusion, loss of balance or vision, and within minutes to hours, death. Cytotoxins are slower acting and destroy cells by disrupting respiration. Symptoms of cytotoxin poisoning range from skin lesions, vomiting, and diarrhea to coughing, choking, coma, and death.[26]

Doctrinal Relevance: Force Projection

Force projection operations follow a general sequence of overlapping steps designed to meet a specific threat. Figure 5 illustrates the force projection process.[27] Force projection usually begins as a contingency operation--a rapid response to a crisis. A rapid U.S. response increases the likelihood that the combatant commander can solve the crisis before it expands beyond immediate containment capabilities. However, denial of strategic airports and seaports by threat forces can impede U.S. response and deny the luxury of staging at ports to build combat power. The purpose of force projection is mission accomplishment. Force projection must be designed and executed to overcome enemy capabilities and other obstacles that impede success, including the use of WMD.[28] It is during force projection that our forces are most vulnerable, and when the enemy possesses WMD, this vulnerability is acute.[29] To mitigate vulnerabilities, multiple, layered active and passive CB defensive measures, including air defense, should be established in the lodgment as rapidly as possible for the protection from TBM, cruise missile (CM), air to surface missiles (ASM) and unmanned aerial vehicle (UAV) threats that could disrupt operations.[30]

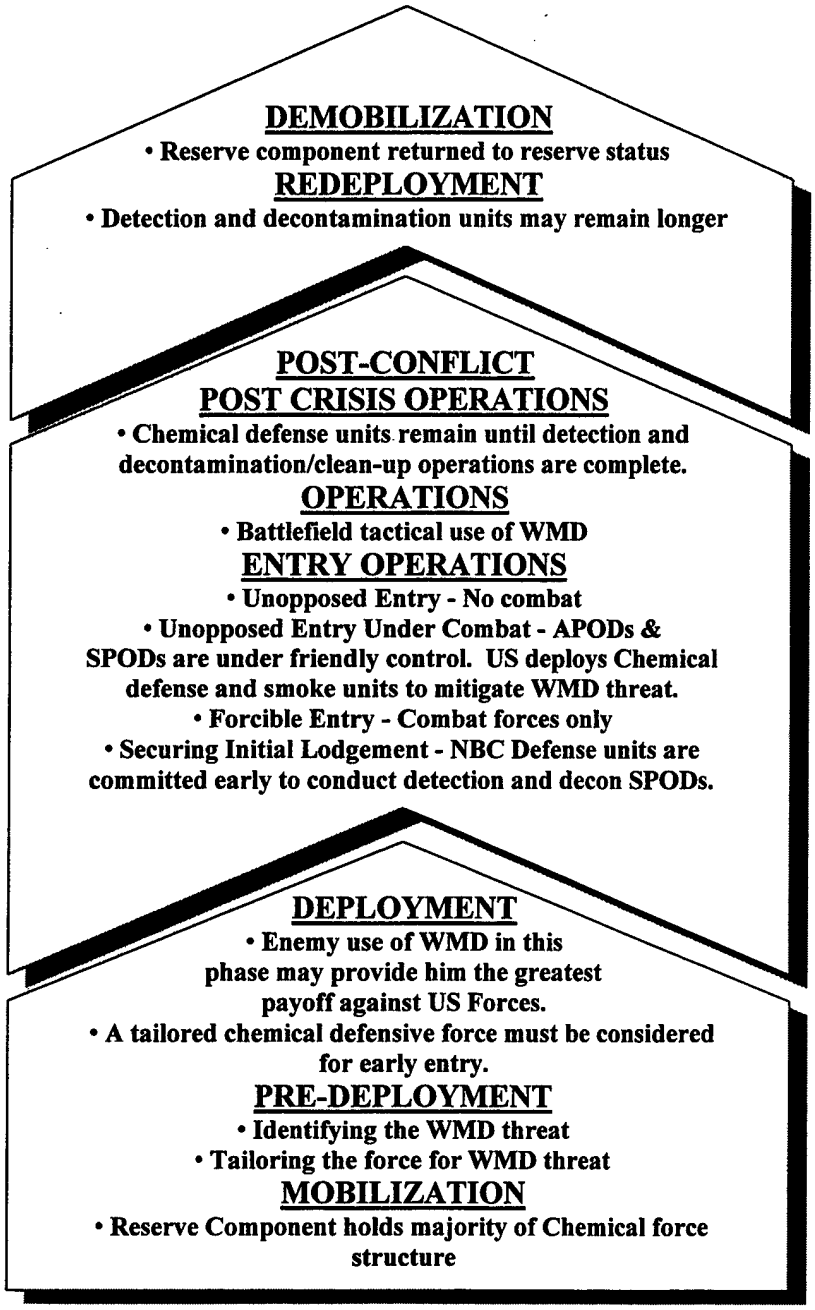

Figure 5. The Eight Steps of Force Projection

Successful force projection introduces lethal forces quickly and paralyzes the enemy will and initiative. Like FM 100-7, *Decisive Force: The Army in Theater Operations*, FM 100-5, *Operations*, stresses the importance of analyzing circumstances,

conditions, and influences in the theater. During intelligence preparation of the battlefield and operational environmental analysis, planners must identify the deployment needs that address enemy CB capability. Establishing the proper force composition enables the commander to set the condition for future success by ensuring the force has the capability to protect aerial or seaports of debarkation (APOD, SPOD) immediately upon arrival.[31]

Doctrinal Relevance: Port Operations

Understanding a little about port operations and terminology is necessary to plan adequate defensive and protective measures. Reception, staging, onward movement, and integration (RSOI) is the logistically complex process by which combat power is generated at the port in the theater of operations and applies across the range of military operations. The RSOI process begins when units arrive at the port. Figure 6 shows the critical nodes of port operations that require protection from conventional and WMD attack.[32]

Command and control of port operations can become complex. During the initial phases of force projection, the Joint Rear Area (JRA) may be extremely undeveloped. Recognizing this, joint doctrine recommends that fellow geographic combatant commanders be called upon to support port operations in neighboring theaters.[33] Figure 7 shows how responsibility for air and seaport operations and defense flows from the theater commander. Port command and control, whether tasked to a supporting geographic commander or the Theater Area Army Commander (TAACOM), will

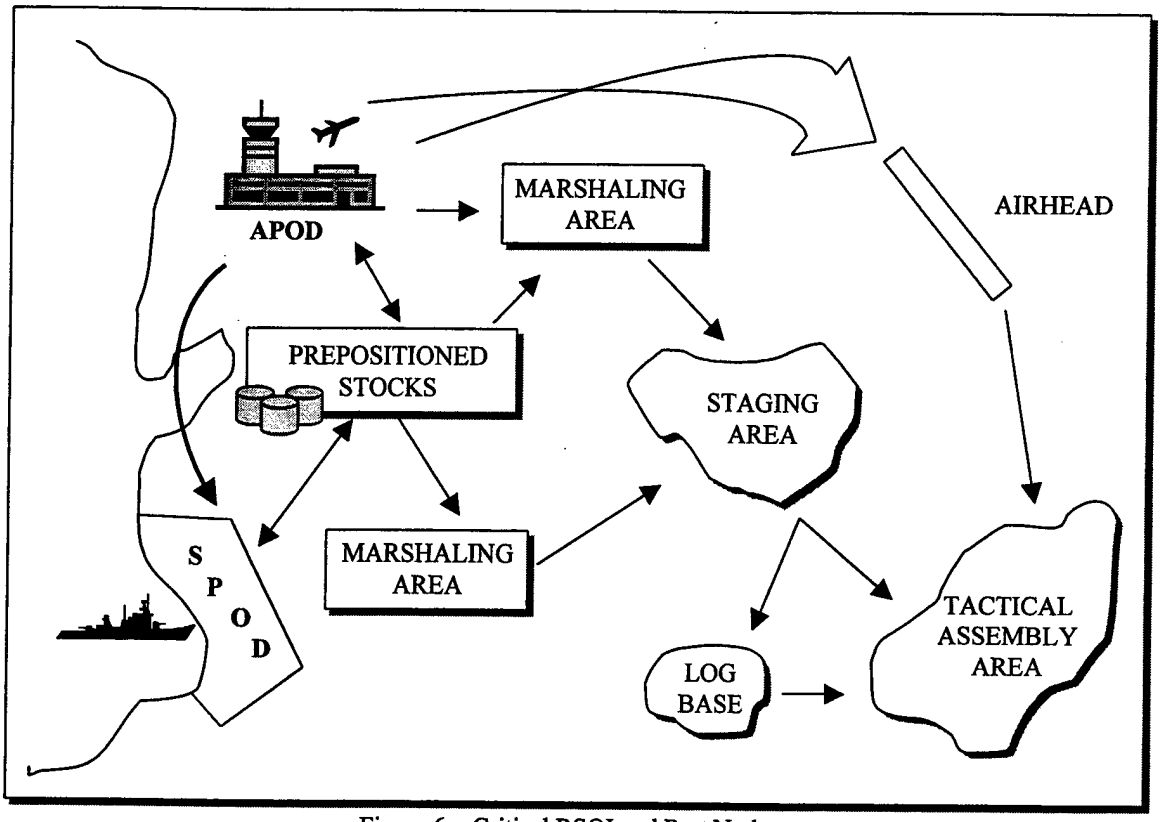

Figure 6. Critical RSOI and Port Nodes.

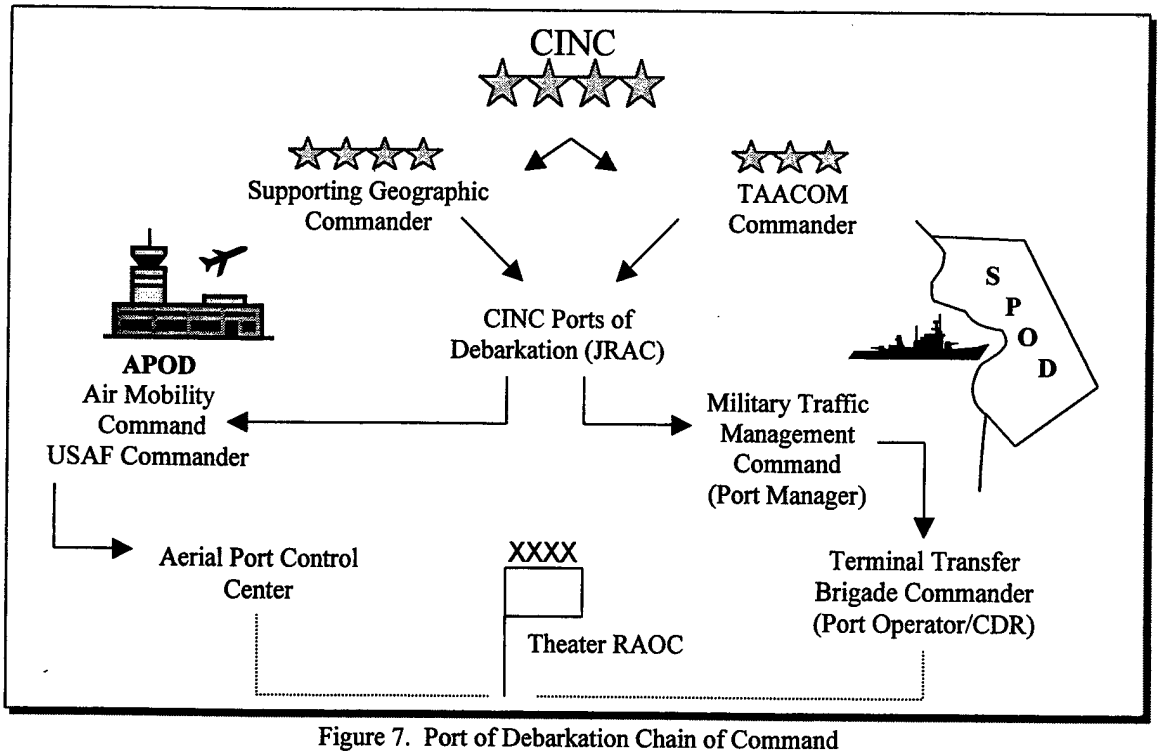

Figure 7. Port of Debarkation Chain of Command

eventually fall within the combatant commander's Joint Rear Area Coordination structure.

The Aerial Port Control Center (APCC) directs all airport operations to include airlift operations, reception, port operations and security.[34] It is this cell that controls a multitude of other subordinate units that will execute the missions mentioned above. There is no mention within Joint doctrine as to how the APCC constructs a port security plan. Aerial ports of debarkation are organized into the offloading ramp area, the holding area, and the marshalling area. The Tanker Airlift Control Element (TALCE) is responsible for disembarking loads from aircraft and turning them over to the Arrival Airfield Control Group (AACG). The AACG will coordinate for and provide logistics needed by the arriving unit to prepare for onward movement. At the marshalling area, the unit completes configuration for combat and prepares for final movement and integration.[35] Figure 8 depicts a notional aerial port of debarkation (APOD).[36]

While aerial ports of debarkation are largely U.S. Air Force functions, seaports are U.S. Army functions. The theater commander designates seaport command and management to the Military Traffic Management Command (MTMC) which in turn designates a Terminal Transfer Brigade (TTBde) as the port operator.[37] As with SPOD operations, the TAACOM and MTMC assists the TTBde with all operations from disembarking loads, to life support, to security, and onward movement.

The MTMC is generally considered DOD's expert on seaport operations yet, Commander's in Chief (CINCs) do not always call on them to assist with planning SPOD operations.[38] The MTMC's supporting role is ill defined and lacks specific doctrine resulting, recently and frequently, in ad hoc theater port management operations.[39] Army

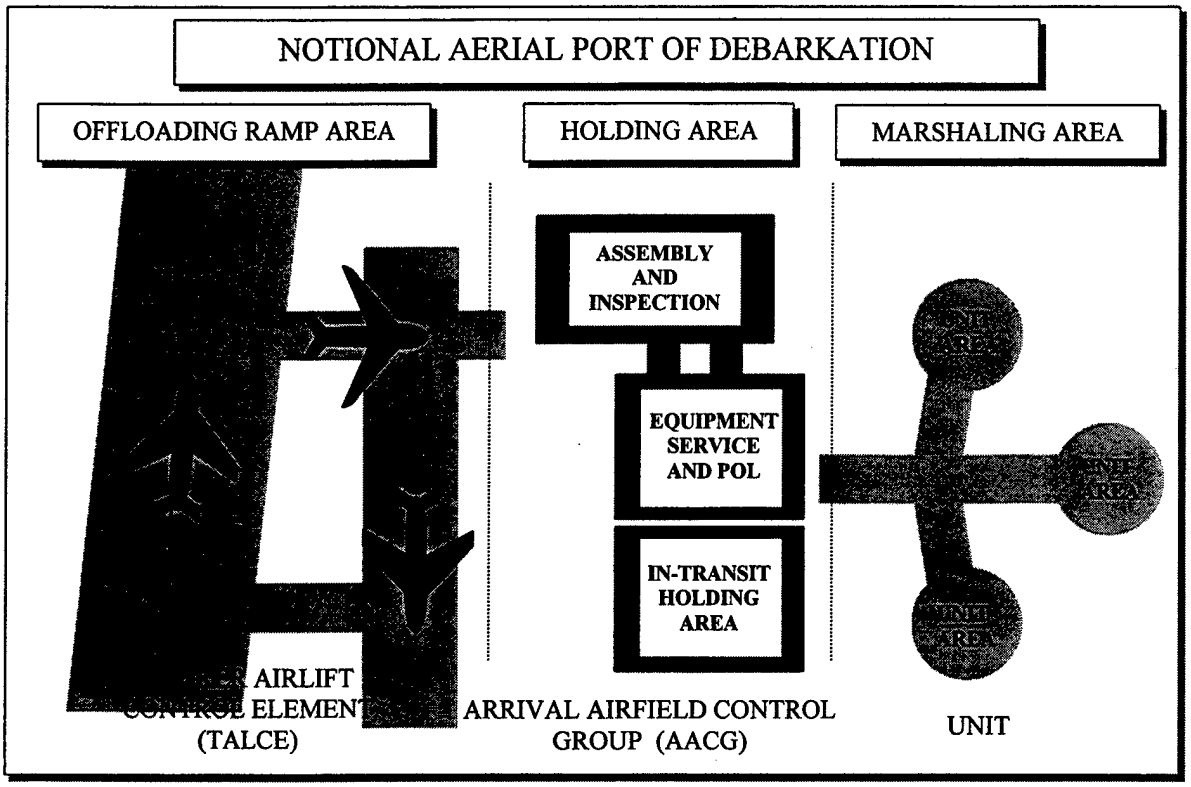

Figure 8. Source: Army Field Manual 55-65, *Strategic Deployment*, p. 8-2, 8-4.

Field Manual 55-60, *Army Terminal Operations*, recognizes the need for security to counter rear-area threats. The operations officer (S3) of the TTBde is responsible for executing inter-service coordination and developing security plans that address protection from and response to air and missile attack, unconventional forces, sabotage, terrorism, mining, and espionage.[40] Port Security Companies are available in the reserve component to assist in this mission.[41] In order to free up MTMC and Terminal Transfer Brigades for other possible contingencies, doctrine encourages the CINC to seek transition from military port operations to commercial port operations as soon as the tactical situation permits.[42] Figure 9 depicts a notional seaport of debarkation.[43]

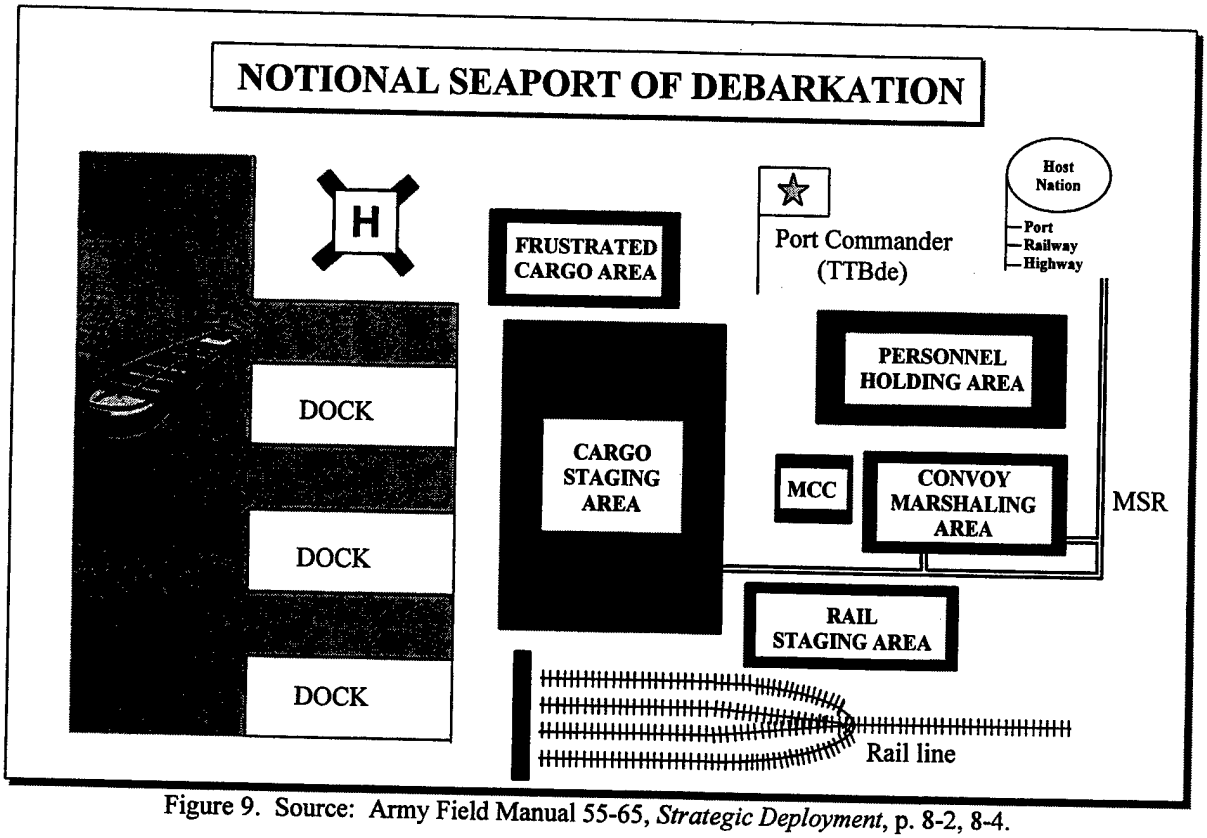

Figure 9. Source: Army Field Manual 55-65, *Strategic Deployment*, p. 8-2, 8-4.

Doctrinal Relevance: Planning, Protection, Response to CB Attack

Basic Army chemical doctrine reinforces the basic chemical defense principles of avoidance, protection, and decontamination.[44] Military forces can often avoid areas of known contamination but must take other precautions to protect against possible enemy delivery of chemical or biological weapons. Protective measures come in the form of individual and collective protective equipment, detection equipment and active and passive defense. Individual equipment consists of protective clothing and a mask with a hood. Collective protection is a self-contained over-pressure environment that allows soldiers to operate under a reduced individual protective posture. Detection equipment, such as passive alarms and CB detection systems, offer early warning of potential

contamination. Active defense involves the initiation of operations to defeat a deployed enemy offensive capability.[45] Examples include security patrols out to apprehend saboteurs or the launching of a Patriot missile to intercept an inbound enemy missile. Passive defense refers to actions taken to reduce vulnerability and minimize the effects of a CB attack.[46] Examples include covering exposed equipment and supplies or dispersing operations to reduce the enemy's targeting capability.

When chemical or biological contamination occurs, decontamination is the U.S. military doctrinal response. The premier U.S. doctrinal publication governing the planning for, protection from and response to chemical or biological attack on ports is Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*. This publication focuses on vulnerability analysis; mitigation and strategy to achieve the NBC defense goals of protecting the force, sustaining command and control, and sustaining combat support functions.[47]

Recognizing that forces are most vulnerable upon initial entry into theater via the ports, vulnerability analysis and mitigation includes the evaluation of multiple ports of debarkation. Fixed sites, whether they are ports or logistics bases, are characterized by bottlenecking and congestion, large area and high value target array and limited mobility and defensive capability.[48] These characteristics provide NBC defense planners with numerous concerns for reducing the strategic and operational impacts of potential or actual enemy CB attack.

Disrupting the command and control infrastructure through the use of CB weapons will severely hinder U.S. operations. Redundant seaport facilities are needed to maintain the flow of combat power and logistics into theater.

> During Desert Storm, WMD attacks against Saudi Arabian east coast ports could have forced a heavier reliance on west coast port operations, resulting in a four-fold increase in trucking distance. With too few trucks already, combat power and sustainment may have staged for days, possibly weeks, on the west coast. DOD personnel, fleet and merchant marine assets, loading and unloading capabilities, transportation services, and host nation support were all potential casualties or degraded capabilities.[49]

When airports become contaminated, strategic air assets, like C-5, C-130, and C-141 aircraft normally will not land and must be diverted or delayed until port operations can resume.[50] When airfields not operating as strategic ports of debarkation are contaminated, the primary impact is decreased sortie rates while intense decontamination operations take place. At logistics bases, the primary risk is contamination of exposed supplies, cargo haul vehicles, and the road networks. The impact can be anywhere from a slowdown to a complete shutdown of support to forward-deployed combat forces. Army Field Manual 3-5, *NBC Decontamination*, outlines tactics, techniques, and procedures for helipad, runway, motor park and terrain decontamination but does not provide operational level guidance for APOD or SPOD decontamination.

Adequate and proper protection of the APODs and SPODs starts with a vulnerability analysis. This is defined as ". . . a systematic method for estimating friendly casualties and/or consequences from . . . enemy NBC attacks."[51] The first phase of this process is a thorough Joint Intelligence Preparation of the Battlespace (JIPB). The JIPB evaluates the physical environment, the effects of the environment, the threat, and the threat courses of action.[52]

Analyzing CB vulnerability and arriving at a risk determination is the next phase. The controlling element of vulnerability analysis is the disposition of U.S. forces under

enemy WMD threat. Therefore, vulnerability analysis considers individual and collective protection capability, detection capability, threat delivery systems and the potential effects of CB agents on U.S. forces in their current locations.[53] Appendix C of Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, provides a mathematical process for estimating chemical casualties based upon threat capability and friendly force vulnerability and must be considered as part of the overall risk assessment. Figures 10 and 11 provide the chemical and biological risk assessment models respectively.[54]

Once the vulnerability and risk level have been determined, measures aimed at reducing the vulnerability are considered. Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, considers mitigation techniques from a tactical level only and does not discuss essential active defense measures. "Fixed site commanders probably have little or no direct control of active defense assets capable of interdicting WMD delivery systems. . . ."[55] However, the publication does discuss, in some detail, the passive defense measures illustrated at figure 12.

The principles reviewed above, vulnerability analysis and risk assessment, are methods to be used by commanders and staffs as they develop NBC defense plans for ports, airfields, and logistics bases. The Military Decision-Making Process (MDMP) at the strategic level results in plans that meet and mitigate the CB threat. These plans enable the CINC to shape the force with adequate active and passive CB defensive measures for joint and multinational operations.[56] Leading the CINC's CB defense efforts for the APODs and SPODs is the Joint Rear Area Coordinator (JRAC). He

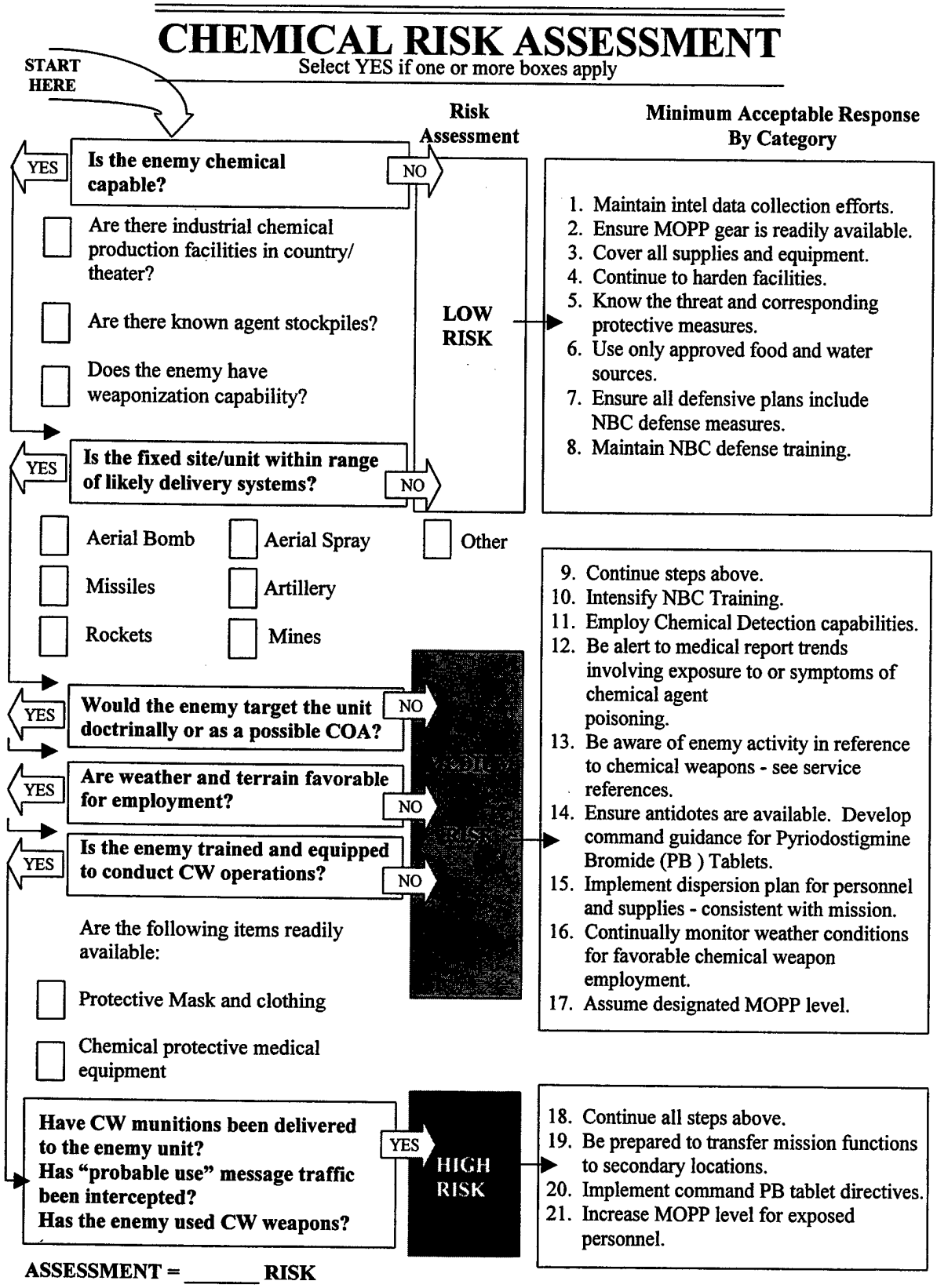

Figure 10. Source: Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, p. C-3.

BIOLOGICAL RISK ASSESSMENT

Select YES if one or more boxes apply

START HERE

Risk Assessment

Minimum Acceptable Response By Category

YES **Is the enemy biological capable?** NO

- ☐ Are there biological production facilities in country/theater (medical or pharmaceutical plants)?
- ☐ Are there known agent stockpiles?
- ☐ Does the enemy have Bio munitions plants?

YES **Is the fixed site/unit within range of likely delivery systems?** NO

- ☐ Aerial Bomb
- ☐ Aerial Spray
- ☐ Other
- ☐ Missiles
- ☐ Artillery
- ☐ Rockets
- ☐ Mines

LOW RISK

1. Ensure immunizations are up to date.
2. Maintain intel data collection efforts.
3. Maintain good personal hygiene.
4. Maintain good area sanitation practices.
5. Ensure MOPP gear is readily available.
6. Maintain physical health.
7. Cover all supplies and equipment.
8. Continue to harden facilities.
9. Know the threat and corresponding protective measures.
10. Use only approved food and water sources.
11. Ensure all defensive plans include NBC defense measures.
12. Maintain NBC defense training.

YES **Would the enemy target the unit doctrinally or as a possible COA?** NO

YES **Are weather and terrain favorable for employment?** NO

YES **Is the enemy trained and equipped to conduct BW operations?** NO

Are the following items readily available:

- ☐ Protective Mask and clothing
- ☐ Is there an immunization capability readily available?

MEDIUM RISK

13. Continue steps above.
14. Intensify NBC Training.
15. Employ Biological Detection capabilities.
16. Be alert to medical report trends involving exposure to or symptoms of biological agent poisoning.
17. Be aware of enemy activity in reference to biological weapons - see service references.
18. Ensure antidotes are available.
19. Implement dispersion plan for personnel and supplies - consistent with mission.
20. Continually monitor weather conditions for favorable biological weapon employment.
21. Assume designated MOPP level.

Have BW munitions been delivered to the enemy unit?
Has "probable use" message traffic been intercepted?
Has the enemy used BW weapons?

YES **HIGH RISK**

22. Continue all steps above.
23. Be prepared to transfer mission functions to secondary locations.
24. Increase MOPP level for exposed personnel.

ASSESSMENT = _____ RISK

Figure 11. Source: Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, p. C-3, C-4.

dedicates NBC protection and defense assets throughout the rear area to the base clusters, of which strategic ports of debarkation are components.

Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, stresses the MDMP and the collection and management of information. It provides, in appendices, an application model of the Universal Joint Task List (UJTL). The UJTL helps determine mission essential tasks for a particular contingency operation. To aid in the planning of joint and multinational operations, a complete listing of engineer and NBC defense equipment by service, and allied county, is included. There are additional annexes devoted to host nation and civilian considerations

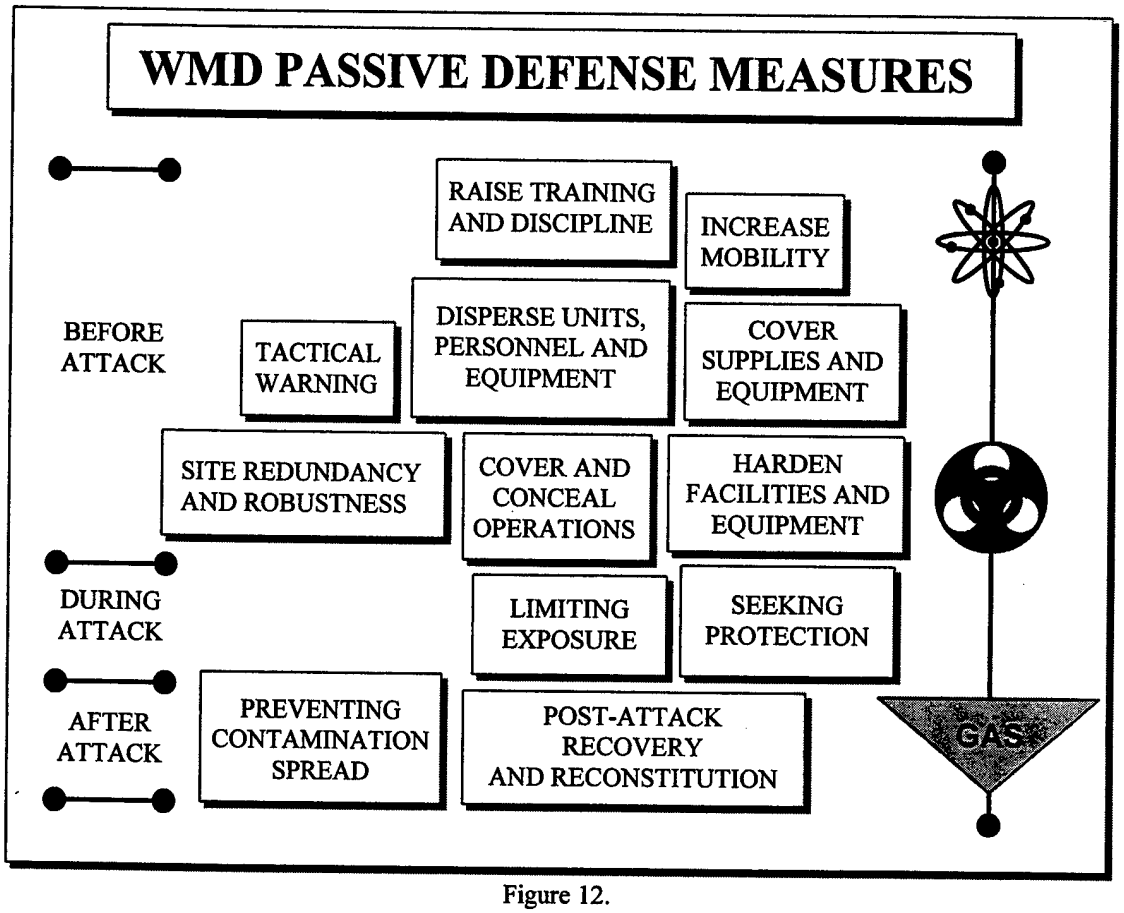

Figure 12.

and decontaminant options for specific types of chemical and biological agents. The information in this field manual makes it a valuable source for what to consider in terms of fixed site defense. The "how-to" remains up to the planner to develop.

Doctrinal Significance

Joint and Army doctrine are the only service doctrines which address issues related to the thesis question. The U.S. Air Force is dependent upon the Army's protection and response and the U.S. Navy NBC defense program does not go beyond individual crew and ship reactions. Henceforth, when reference is made to doctrine, it is a reference to Army and Joint doctrine. Doctrine is very consistent in the method for assessing the operational environment with regard to planning effective defensive operations. There is overwhelming agreement that, regardless of the operational environment, military forces are most vulnerable to enemy conventional or CB attack during initial entry into theater at the ports. With the exception of Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, CB threat is discussed almost exclusively from the perspective of main battle area employment. Joint doctrine and the current editions of Army Field Manual 100-5, *Operations,* and Army Field Manual 100-7, *Decisive Force: The Army in Theater Operations,* only mention that ports and rear areas are vulnerable to CB attack. They offer no consideration as to what the consequences might be if a port is attacked during force buildup operations. In fact, there is no doctrine that addresses the consequence management of CB attack in the ports during force buildup operations.

The failure of doctrine to address NBC defense and consequence management while forces are flowing in through the ports is a significant doctrinal weakness. CB attack of a port is a worst case scenario so complex that it must be planned and prepared for in advance while time is available. Doctrine agrees that U.S. forces are most vulnerable upon initial entry at the ports, but provides no recommendations or solutions to counter a successful CB attack. Unlike mechanized brigades that continually move across the battlefield, ports are fixed sites that are easily targeted. If ports are denied by enemy CB attacks prior to any U.S. presence, the only solution will be to use alternate ports and methods for bringing combat power ashore. However, once the U.S. has set up and implemented RSOI operations, the cost, in terms of time and assets, to shift to unprepared ports may demand that the contaminated port be recovered rapidly.

Chemical defense doctrine acknowledges the omission of active defense measures as part of fixed site protection because it assumes a port commander will not have control of the types of assets required for active defense.[57] This is the only part of Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, that does not address operational and strategic NBC defense considerations. Active defense assets such as Patriot batteries and threat containment forces are integral to strategic port defense.

Army Field Manual 44-85, *Patriot Battalion and Battery Operations*, provides an APOD or SPOD commander useful insight on ballistic missile defense that can assist in risk determination and port CB defense asset allocation. For example, Patriot units, under the control of the JRAC, may be employed in either asset or area protection missions. These missions impact the degree of coverage over a port. The port

commander, understanding these missions, can now manage his or her remaining CB defense assets more effectively. Regardless of ownership, the port commander, under direction of the JRAC, may be tasked to integrate certain active defense units into the port CB defense plan. Given the complexity of port CB defense and consequence management, omitting consideration of these units from CB defense doctrine for any reason is a mistake.

Seaport operation doctrine is admittedly weak with regard to command and control and the roles and responsibilities of MTMC.[58] When the MTMC is the recognized expert for seaport operations and the CINC does not routinely employ them, the resulting ad hoc operation may find itself reinventing existing processes. Recent deployments to Rwanda, Somalia, and Haiti confirm this.[59] These operations demonstrated the need for more consistent seaport management doctrine similar to that employed by Air Mobility Command (AMC) for aerial ports.[60] Army Field Manual 55-60, *Army Terminal Operations*, enumerates responsibilities for the Port Manager (MTMC) and Port Operator (TTBde).

The thesis question proposes a complex question that is not answered with today's doctrine. Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, comes the closest of any publication to addressing the issues directly related to the thesis. However, a joint staff planner must be able to develop and recommend a comprehensive APOD and SPOD WMD defense plan that addresses actions prior to and during force buildup operations. While Patriot batteries performed well in Desert Storm, not every SCUD missile was intercepted. When the CB attack occurs in port, the U.S. response must be preplanned, resourced, and ready to execute.

Assessment of Theses and Monographs

The institutions that supervised the production of the theses and monographs are credited for training the nation's senior military leaders. These institutions are the premier U.S. military educational facilities for the services' senior officers. Successful completion of the course work virtually extends the institution's credibility to the authors who now stand as among the very best within their respective career fields. The monograph by Lieutenant Colonel Charles Bass, titled "Theater Planning for Chemical Defense: Lessons from History" is the most relevant with respect to CB threat analysis. Lieutenant Colonel Bass, a career chemical officer, completed his study in June 1997 while attending the School of Advanced Military Studies at Fort Leavenworth, Kansas. Additional monographs, compiled by a mix of Army, Navy, and Marine Corps officers, focused on TBMD as a response to the CB threat. Within TBMD, authors emphasized counter-force, or attack operations, and active defense. It is important to note that Joint TBMD incorporates passive measures to include the NBC defense principles of contamination avoidance, protection, and decontamination. None of the authors provided any consequence management considerations in the event of a successful WMD attack in the ports. As with doctrine, this critical piece remains unanswered.

Theses and Monograph Relevancy: Threat

Knowing the WMD capability of a potential adversarial nation and understanding how and why a threat force might employ chemical or biological weapons is the first step in developing a theater chemical defense plan. During the Iran/Iraq War, Iraq first used chemical weapons as a last resort "to forestall routs of his forces against human-wave

assaults of the Iranian Revolutionary Guard. This helped prevent embarrassing defeat" as they tried to build a reputation of a strong nation in the eyes of the world.[61] "In a seemingly unwinnable war, the Iraqi dictator, Saddam Hussein, released the tactical control of chemical weapons to his generals. Lacking an international perspective, they proceeded to aggressively integrate chemical weapons into their battle plans."[62]

The United States can not destroy the total WMD capability of an enemy in war simply because many of these weapons are easy to build and conceal. Many countries hostile to the U.S. present potential WMD threats. Iran has been producing blister, blood, and choking agents in the hundreds of tons since 1984.[63] In addition to already possessing the SCUD missile and weaponized artillery rounds, Iran is pursuing long-range missile technology from North Korea and China.[64] The WMD stockage in Iraq is undetermined. They have the production and delivery capability for chemical and biological weapons and it is believed their programs can be revived quickly now that the international community has discontinued the protracted United Nations weapons inspections, mandated at the end of the Persian Gulf War.[65] Libya, while not successful in WMD production, has been able to purchase agents from Iran and continues to pursue high tech missile delivery systems.[66]

In his monograph, Commander William Larson suggests that a number of people from developing countries are of the opinion that to die by chemical weapons is neither more or less horrible than to die by conventional weapons.[67] If this belief is widely shared, third world reliance on WMD could become the mainstay of their national defenses, increasing the threat they pose to neighbors and forward-deployed U.S. forces.

Through his study of the Persian Gulf War, Lieutenant Colonel Charles Bass concluded that Iraq's non-use of chemical weapons was the result of a deliberate outcome analysis. He proposes that Iraq should not have employed chemical weapons unless they could deliver them in the face of coalition countermeasures and still achieve a net benefit. Add to this the ability of the coalition to mitigate the effects and then respond with overwhelming retaliatory strikes.[68] Coalition forces, unlike the Iranians in the 1980's, were largely mechanized which offers a greater degree of protection from CB weapon attack. Where the Iranians were relatively concentrated, the Coalition was dispersed over a wide area which denied the Iraqi Army any possibility of being able to mass the effects of CB weapons on Coalition forces.[69] The absence of chemical weapon stocks in Kuwait at the end of the war seems to indicate a lack of intent to use. Lieutenant Colonel Bass concludes that when Iraq saw this coalition was determined to fight, they adopted a "survival strategy" for which CB weapon use did not apply.[70] It is argued that Saddam Hussein believed that any CB weapon use on his part would have invited massive retaliation, possibly a nuclear response, thereby destroying his regime completely.

Retaliation in kind, strategic and tactical asymmetric advantage, and integration with conventional fire and maneuver summarize Lieutenant Colonel Bass' conclusions pertaining to enemy considerations for WMD use.[71] At the strategic level, an enemy must consider coalition retaliation with regard to his own ability to operate and resume the offensive in the aftermath of that retaliation.[72] The ability to deliver chemical, nuclear, or overwhelming conventional retaliation nullifies the enemy's belief that he possesses an asymmetric advantage. History bears out that chemical weapon use by itself

has not been decisive. What it has done is disrupt command and control, logistics, and create fear and terror.[73]

Theses and Monograph Relevancy: Protection and Response to CB Attack

The impact of WMD on U.S. forces or strategic interests can have disastrous consequences. U.S. strategy that responds to this threat falls under the concepts of counter-force, active defense, and passive defense.[74] Counterforce refers to the ability to strike the enemy's WMD capability before it is used to inflict damage on U.S. forces.[75] At the strategic level, these strikes are focused on enemy assets before they can be mobilized and deployed for attack while tactical counter-force occurs on the battlefield with U.S. forces locating enemy forces and striking first.[76] The air campaign of Operation DESERT STORM, it can be argued, was an example of tactical counter-force executed at the strategic level. The six-week bombing campaign plus the hunting of SCUD launchers was aimed at destroying Iraqi capabilities before they might be employed against inbound and staged U.S. and coalition forces.

During Operations DESERT SHIELD and DESERT STORM, U.S. forces were not able to locate and kill all SCUD systems. When counter-force fails, active defensive measures are employed. Active defense is the destruction of surviving weapons, such as theater ballistic missiles (TBM) for example, during the course of delivery.[77] Today, the only U.S. TBM defense capability is the Patriot system and its evolving improvements.[78] Destroying SCUD missiles in flight was accomplished by air defense artillery systems such as the Patriot. However, not every SCUD missile launched was intercepted and

Destroyed, thereby necessitating the need for additional defense. Passive defense, the final tier, consists of protective measures that serve to mitigate the effects of enemy weapons. With regard to CB weapons, this means NBC protection, contamination avoidance, and decontamination.[79] The doctrinal portion of this chapter explained these terms in detail and, therefore, will not be discussed again.

The U.S. military is striving to improve its WMD defense capability as a joint force. Joint theater missile defense (JTMD) involves Attack Operations, Passive Defense, and Battle Management Command, Control, Communications, Computers, Intelligence (BMC^4I).[80] These measures are the fundamental concepts being integrated into future Army and Navy TBMD capabilities. Today, when a crisis erupts in a far corner of the earth, the U.S. Navy is usually first on the scene. In order for the U.S. to be able to project power, the Navy must play an active role in TBM defense. The Navy's ballistic missile defense concept is a two-tiered defense plan, Navy Area Defense (NAD) and Navy Theater Wide Defense (TWD), and will be the responsibility of the Aegis platforms in the fleets.[81] Both NAD/TWD and Patriot/Theater Area Air Defense (THAAD) are illustrated at figure 13. The lower tier, NAD, is a ground-level point defense system similar in terms of range and overall capability to the U.S. Army Patriot missile defense system. NAD does have limitations in that the Aegis platform can not re-arm at sea due to onboard equipment limitations.[82] The upper tier, TWD, will incorporate the SM2/LEAP missile. These systems will give the CINC an extended range capability of over 100 kilometers, similar to the U.S Army's Patriot PAC 3 and THAAD.[83] The two upper tier systems are still in development and will not be available prior to fiscal year 2005.[84]

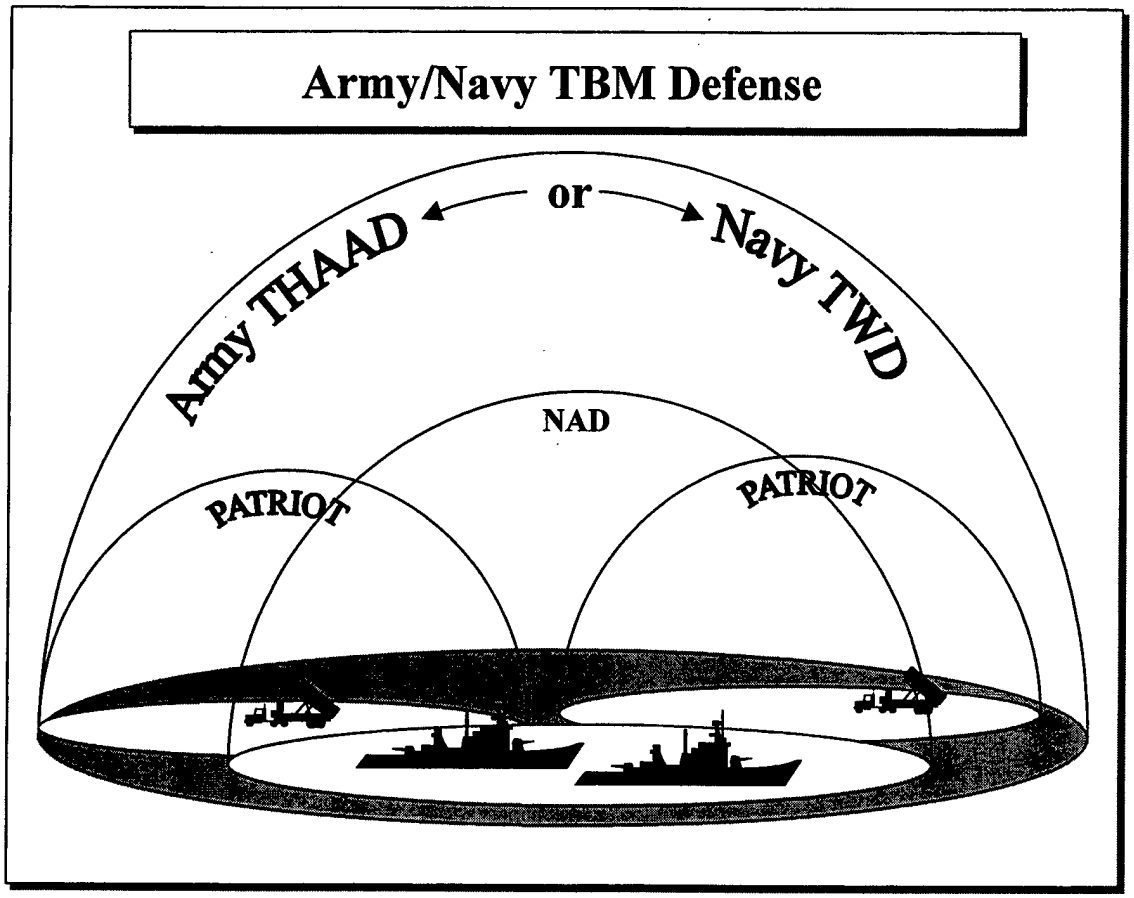

Figure 13.

Thesis and Monograph Significance

The prevalent patterns surfacing in these monographs focus on threat capability and intent to use along with a primary U.S. response plan anchored in the concepts of counterforce and active defense, both subsets of Joint Theater Ballistic Missile Defense. Joint doctrine has been careful in defining joint TBMD active as well as passive defense measures. The monographs examined here do not discuss any passive defense measures that must be planned for when that one TBM with a chemical or biological warhead lands in the rear area. While it takes about nine TBMs to contaminate one square kilometer

and produce 25 percent casualties for unprotected personnel, a few well placed chemical attacks could paralyze operations in the entire theater rear area.[85]

Assessment of the *CB 2010 Study*

In 1997, the Office of the Secretary of Defense commissioned a study to determine the impacts of CB attacks during the force projection stages of a major theater war in the year 2010. To assess the affects, a cadre of eighteen flag and general officers developed an Iraqi threat scenario with multiple chemical and biological agent strikes in the U.S., at pre-positioned equipment sites supporting the Persian Gulf Region, and at the strategic ports of debarkation in Saudi Arabia and Kuwait.[86] The cadre received briefings on intelligence projections of the political and military situations in 2010, joint and service operational concepts, current and projected research and development programs, and force structure. Scenarios were constructed and interactively gamed twice, once under the condition of conventional weapons only, then under the condition of CB weapon employment. The final conclusion stated:

> The disruption caused by chemical and biological strikes . . . at Diego Garcia, and at the planned air and seaports of debarkation prevents effective U.S. intervention until Iraq has taken Kuwait City. With Iraq proclaiming in the United Nations that it is ceasing military operations, that free elections will be held in its reclaimed province, and that oil sales will continue unabated at pre-conflict prices, continuation of the conflict by the U.S. takes on a different international political parameter. Although the U.S. can prevail militarily, it can do so only with a more prolonged conflict and significantly greater casualties. Faced with the increased difficulty of ejecting a military force, compared to preventing its occupation, the U.S. has to deal with the uncertainty of continued coalition alliances and possible lack of political support from other nations.[87]

Assessment of Relevancy: Protection from CB Attack

The findings, relevant to the thesis and explained below, include protection of ports, intelligence assessment, decontamination considerations, and host nation protection. This study concludes that the focus on massive battlefield use of WMD has driven CB defense research and development away from the critical nodes of force projection which are, today, critical to U.S. national military strategy. Therefore, U.S. forces must refocus NBC defense efforts on strategic ports and be able to quickly decontaminate those facilities to include the electronic systems, large aircraft, and a variety of other mission essential equipment.[88] The anticipated public reaction to a CB attack is fear and panic thus raising issues related to their protection and reassurance that U.S. forces eliminate the hazards rapidly and to high standards of cleanup.[89]

At the ports of debarkation and maritime prepositioned ship (MPS) anchorages, the *CB 2010 Study* determined that essential mission-related civilian personnel who were not trained or equipped to operate in a CB environment suffered significantly creating a major impact on the scenario outcome.[90] These civilian personnel included host nation and foreign contractors, Military Sealift Command (MSC) crews and members of the Civil Reserve Air Fleet (CRAF). The recommendations stated the need for early deployment of CB reaction task forces with both active and passive defense capabilities.[91] Civilians must be provided protective equipment and training for that equipment. Coalition forces must be encouraged to upgrade and intensify their NBC defensive training. And lastly, all MPS anchorages must be upgraded with warning,

detection, and decontamination equipment. This must include individual protective equipment and training for crews operating the ships at those anchorages.

Current decontamination procedures do not address requirements for afloat prepositioned equipment, sensitive electronic equipment, conditions for resumption of operations at air and seaports, or release of formerly contaminated equipment back to the Continental United States (CONUS). In a broad stroke recommendation, the study suggests that the Department of Defense (DoD) address these issues in the form of doctrine and regulatory guidance. The lack of protection for civilian personnel at the ports of debarkation is a serious problem. It is also recommended that DoD train its civilian employees in NBC defense and require contracting organizations, with military assistance, to do the same with their employees.[92]

Significance of the *CB 2010 Study*

The *CB 2010 Study* strikes at the heart of the thesis question. While not offering procedures to protect and defend the ports from CB attack, the recommendations, in most cases, are detailed enough to facilitate immediate planning and execution. The *CB 2010 Study* is graphic in its portrayal of the potential threat in the year 2010 and offers additional recommendations for research in the areas of CONUS port WMD protection.

Chapter Summary

Joint and Army doctrine are the only service doctrines that address issues related to the thesis question. There is universal recognition among doctrinal publications that the WMD threat facing U.S. forces at the strategic ports is acute and the primary form of

defense is JTBMD. While Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*, addresses related concepts in broad terms, there is no doctrine that discusses, procedurally, how U.S. forces are to plan, prepare, and conduct decontamination operations and life support for ports and MPS anchorages. Complicating the problem is that seaport operation doctrine is admittedly weak. The MTMC is the recognized expert in this field but is not routinely called upon by the CINCs to coordinate the mission. Consequently, if NBC defense doctrine was complete, command and control problems at the ports may interdict its proper application.

An exhaustive search within the scholarly archives produced many theses and monographs that dealt with broad, conceptual issues of port protection from WMD. The prevalent themes were threat potentials and TBMD. While there are no specific recommendations for consequence management, there is tremendous insight from the authors on conditions and considerations for potential enemy use of WMD both at the ports and on the tactical battlefield. Through its graphic, real world portrayal of a future threat, the *CB 2010 Study* offers the most relevant port and MPS anchorage defense considerations of any publication category. The depth of the recommendations made by the cadre of general and flag officers seem to indicate that the NBC defense needs of the strategic nodes have eluded the doctrine writers and scholars.

Chapter 3 describes the research methodology employed to answer the thesis question. The inter-relationships of threat, operational environment, force projection, port operations, and CB planning, protection, and response form the crux of the methodology; establish the analytical framework for chapter 4 and set the stage for final conclusions and recommendations in chapter 5.

[1]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 1-3.

[2]Ibid., 2-1.

[3]Department of the Army, Field Manual 3-100, *Chemical Operations, Principles and Fundamentals* (Washington, DC: U.S. Government Printing Office, 1996), 2-4.

[4]Ibid.

[5]Ibid.

[6]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 6-10.

[7]Department of the Army, Field Manual 100-7, *Decisive Force: The Army in Theater Operations* (Washington, DC: U.S. Government Printing Office, 1995), 2-28.

[8]Ibid., 2-27.

[9]Ibid., 2-29.

[10]Department of the Army, Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports, and Airfields - Draft* (Washington, DC: U.S. Government Printing Office, 1998), 1-3 (hereafter cited to as Army FM 3-4-1).

[11]Ibid.

[12]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 6-10.

[13]Department of the Army, Field Manual 34-130, *Intelligence Preparation of the Battlefield* (Washington, DC: U.S. Government Printing Office, 1994), 6-0 – 6-19.

[14]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 6-10.

[15]Department of the Army, Field Manual 3-3, *Chemical and Biological Contamination Avoidance* (Washington, DC: U.S. Government Printing Office, 1994), 1-2.

[16]Ibid.

[17]Ibid., 3-0.

[18]Army, FM 3-4-1, 1-4.

[19]Ibid., 1-5.

[20]Ibid., 1-4.

[21]Department of the Army, Field Manual 3-3, *Chemical and Biological Contamination Avoidance* (Washington, DC: U.S. Government Printing Office, 1994), 1-2.

[22]Ibid.

[23]Ibid., 3-1.

[24]Ibid., 4-0.

[25]Ibid.

[26]Ibid.

[27]Department of the Army, Field Manual 3-100, *Chemical Operations, Principles and Fundamentals* (Washington, DC: U.S. Government Printing Office, 1996), 9-2.

[28]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 3-3.

[29]Ibid., 3-10.

[30]Department of the Army, Field Manual 100-7, *Decisive Force: The Army in Theater Operations* (Washington, DC: U.S. Government Printing Office, 1995), 6-17.

[31]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 3-4.

[32]Department of the Army, Field Manual 55-65, *Strategic Deployment* (Washington, DC: U.S. Government Printing Office, 1995), 8-1.

[33]Joint Pub 4-01.1, *Joint Tactics, Techniques and Procedures for Airlift Support to Joint Operations* (Washington, DC: Department of Defense, June 1998), III-3.

[34]Ibid., II-10.

[35]Department of the Army, Field Manual 55-65, *Strategic Deployment* (Washington, DC: U.S. Government Printing Office, 1995), 8-2, 8-3.

[36]Ibid., 8-2, 8-4.

[37]Department of the Army, Field Manual 55-60, *Army Terminal Operations* (Washington, DC: U.S. Government Printing Office, 1996), 3-3, 3-4.

[38]Ibid., 3-2.

[39]Ibid.

[40]Ibid., 3-6.

[41]Ibid.

[42]Ibid., 3-4.

[43]Department of the Army, Field Manual 55-65, *Strategic Deployment* (Washington, DC: U.S. Government Printing Office, 1995), 8-2, 8-4.

[44]Army, FM 3-4-1, 2-2.

[45]Department of the Army, Field Manual 101-5-1, *Operational Terms and Graphics* (Washington, DC: U.S. Government Printing Office, 1997), 1-2.

[46]Ibid., 1-118.

[47]Army, FM 3-4-1, Summary-2.

[48]Ibid., 2-2.

[49]Ibid., 2-3.

[50]Ibid.

[51]Ibid.

[52]Ibid., 2-4.

[53]Ibid., 2-5.

[54]Ibid., C-3, C-4.

[55]Ibid., 2-6.

[56]Ibid., 3-3, 3-4.

[57]Ibid., 2-6.

[58]Department of the Army, Field Manual 55-60, *Army Terminal Operations* (Washington, DC: U.S. Government Printing Office, 1996), 3-2.

[59]Ibid.

[60]Ibid., 3-3.

[61]Charles A. Bass, Jr, "Theater Planning for Chemical Defense," Monograph (Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, 1997), 21.

[62]Ibid.

[63]William Jed Larson, "Chemical and Biological Weapons: A Growing Problem for the CINC," Monograph (Newport, RI: U.S. Naval War College, 1997), 2.

[64]Ibid.

[65]Ibid., 3.

[66]Ibid.

[67]Ibid., 6.

[68]Charles A. Bass, Jr, "Theater Planning for Chemical Defense," Monograph (Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, 1997), 24.

[69]Ibid., 25.

[70]Ibid., 28.

[71]Ibid., 29.

[72]Ibid., 30.

[73]Ibid., 31.

[74]Michael W. Ryan, "Weapons of Mass Destruction," Monograph (Carlisle Barracks, PA: U.S. Army War College, 1997), 7.

[75]Ibid.

[76]Ibid.

[77]Ibid., 12.

[78]Daniel M. Brintzinghoffer, "Naval Theater Ballistic Missile Defense (TBMD)," Thesis, Master of Science in Systems Technology (U.S. Naval Postgraduate School, 1996), 87.

[79]Michael W. Ryan, "Weapons of Mass Destruction," Monograph (Carlisle Barracks, PA: U.S. Army War College, 1997), 17.

[80]Daniel M. Brintzinghoffer, "Naval Theater Ballistic Missile Defense (TBMD)," Thesis, Master of Science in Systems Technology (U.S. Naval Postgraduate School, 1996), 3.

[81]Ibid., 7.

[82]Ibid., 89.

[83]Ibid., 87.

[84]Ibid., 7.

[85]Charles A. Bass, Jr, "Theater Planning for Chemical Defense," Monograph (Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, 1997), 43-44.

[86]Office of the Secretary of Defense, "Assessment of the Impact of Chemical and Biological Weapons on Joint Operations in 2010," Summary Report (McLean, Virginia: Booz•Allen & Hamilton, Inc., 1997), 4-7.

[87]Ibid., 22.

[88]Ibid., 25.

[89]Ibid.

[90]Ibid., 28.

[91]Ibid., 29.

[92]Ibid., 33.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction: Research, Evaluation, Integration, and Recommendations

The research methodology used in this study is centered upon threat capabilities across a range of operational environments and military operations. Figure 14 illustrates the thesis and supporting questions addressed in this study. The research methodology model, illustrated at figure 15, identifies the key research components and the chemical and biological (CB) defense model. Both the research components and the CB defense model are borne out of the thesis question and the research of doctrine, scholarly work, and any other source of doctrinally based information. The integration of the research components with the CB defense model results in a preliminary port CB defense planning framework that is subsequently evaluated against a set of criteria. This evaluation identifies shortfalls in the CB defense plan. The shortfalls serve as the basis for the development and integration of recommendations that will produce a comprehensive port CB defense planning framework.

Figure 16, the Operational Environment Assessment Model,[1] serves as the catalyst for the development of evaluation criteria. The circumstances, influences, and conditions provide a simple framework for analyzing the key research components and the CB defense model. The evaluation criteria are (1) actions address complete range of threats, (2) actions apply to the range of operational environments, (3) actions apply to

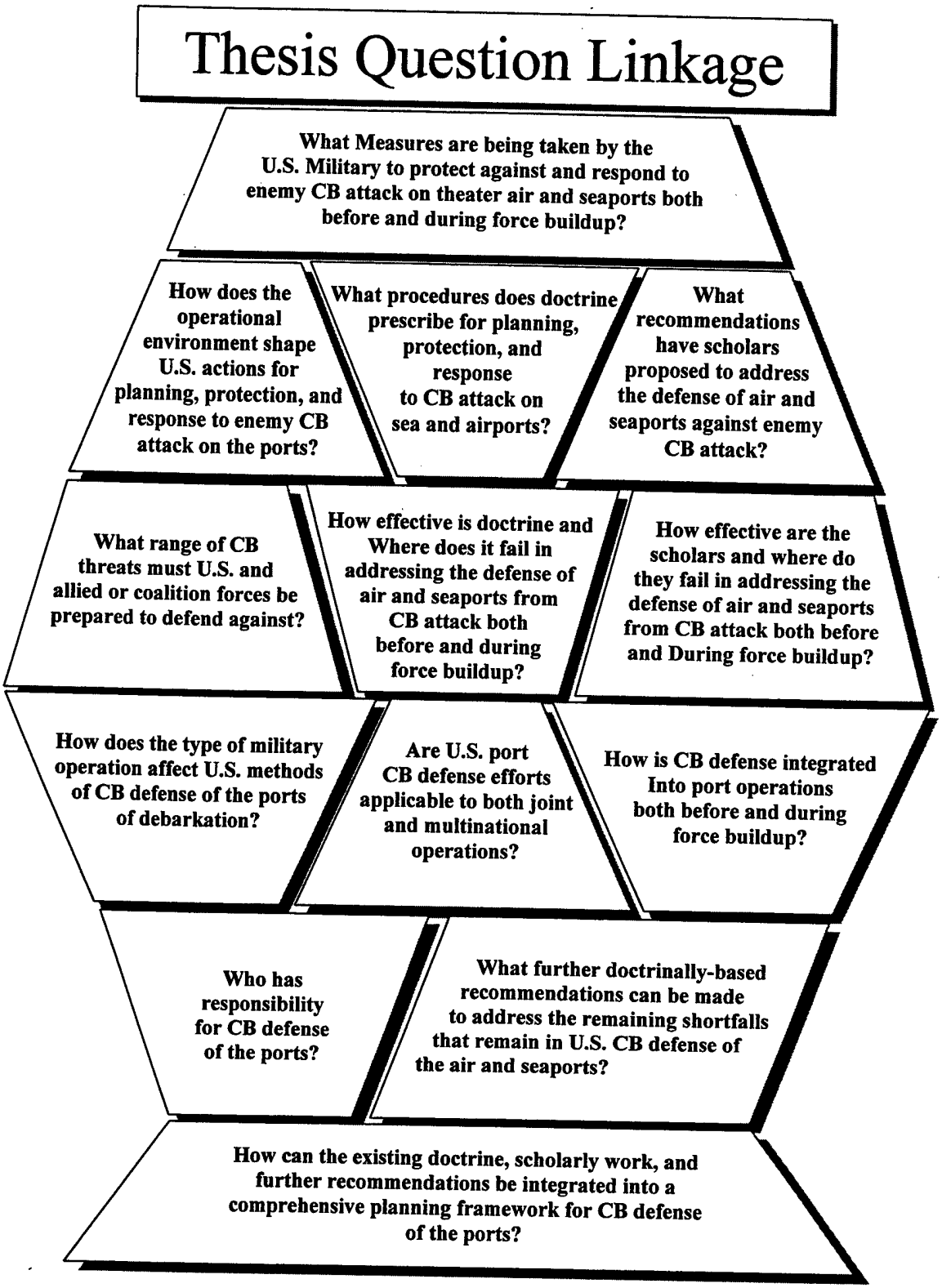
Thesis Question Linkage
What Measures are being taken by the U.S. Military to protect against and respond to enemy CB attack on theater air and seaports both before and during force buildup?
How does the operational environment shape U.S. actions for planning, protection, and response to enemy CB attack on the ports?
What procedures does doctrine prescribe for planning, protection, and response to CB attack on sea and airports?
What recommendations have scholars proposed to address the defense of air and seaports against enemy CB attack?
What range of CB threats must U.S. and allied or coalition forces be prepared to defend against?
How effective is doctrine and Where does it fail in addressing the defense of air and seaports from CB attack both before and during force buildup?
How effective are the scholars and where do they fail in addressing the defense of air and seaports from CB attack both before and During force buildup?
How does the type of military operation affect U.S. methods of CB defense of the ports of debarkation?
Are U.S. port CB defense efforts applicable to both joint and multinational operations?
How is CB defense integrated Into port operations both before and during force buildup?
Who has responsibility for CB defense of the ports?
What further doctrinally-based recommendations can be made to address the remaining shortfalls that remain in U.S. CB defense of the air and seaports?
How can the existing doctrine, scholarly work, and further recommendations be integrated into a comprehensive planning framework for CB defense of the ports?

Figure 14.

joint and multinational operations, (4) actions provide for consequence management at ports of debarkation, and (5) responsibility for actions is fixed.

Military capabilities are developed in response to threat capabilities or potential. U.S. actions must be applicable across a range of threats, from terrorism through insurgency to peer opponent. Similarly, U.S. actions must be balanced against threat capabilities present across a range of military operations that span from operations other than war (OOTW), occurring in either peacetime or limited conflict, up to major theater war (MTW). In the era of weapons of mass destruction (WMD) proliferation, port CB defense considerations must be developed to counter postulated CB threat potentials in every military operation.

Planning, protection, and response must also apply to a variety of operational environments. The multitude of varying circumstances, conditions, and influences existing across the range of military operations requires that CB defense actions be overarching and flexible. As U.S. military operations progress from joint to joint and multinational, CB defense must include the needs and capabilities of U.S. services and the services of foreign countries. When all forces are programmed into the theater CB defense plan, the integrity and cohesion of a joint or multinational force is strengthened.

Consequence management is a vital piece of the U.S. military's port CB defense strategy. As depicted in chapter 1, U.S. force projection capability is dependent not only upon the ability to deter CB weapon use, but also to recover from its effects when it is used on strategic ports. It is essential that U.S. actions provide for the protection and decontamination of personnel, equipment, and facilities in the ports of debarkation. The final evaluation criterion is the fixing of responsibility. Measures that guide planning,

protection, and response have a greater chance for success when command responsibility is clearly defined. This is especially critical for port CB defense.

The criteria will support analysis and allow for fact-based conclusions to the thesis and subordinate research questions in chapter 4. The analysis and conclusions funnel the pertinent doctrine, scholarly work, and other appropriate publications into an integrated framework. This framework facilitates planning for, protecting from, and responding to CB attack in the ports both before and during force build-up. Chapter 2 briefly identified some strengths and weaknesses of the literature and, in a broad context, has identified gaps in port CB defense doctrine. These gaps demand immediate solutions. Chapter 4 will re-emphasize those issues and lay the groundwork for additional research and recommendations in chapter 5.

Evaluation of Focused Literature Review

The thesis and subordinate questions focused the research into five areas: (1) theater operational environment, (2) chemical and biological threat, (3) force projection, (4) port operations, and (5) planning, protection and response to CB attack in the ports. Research in each focused area revealed the doctrine and scholarly work applicable to answering the research questions. In chapter 4, the integration of that research with the CB Defense Model will be evaluated against the criteria explained earlier in this chapter (see figure 15). The CB Defense Model consists of four components essential for port CB defense in any operational environment. Those components are the threat analysis, vulnerability assessment, vulnerability mitigation, and consequence management planning and execution.

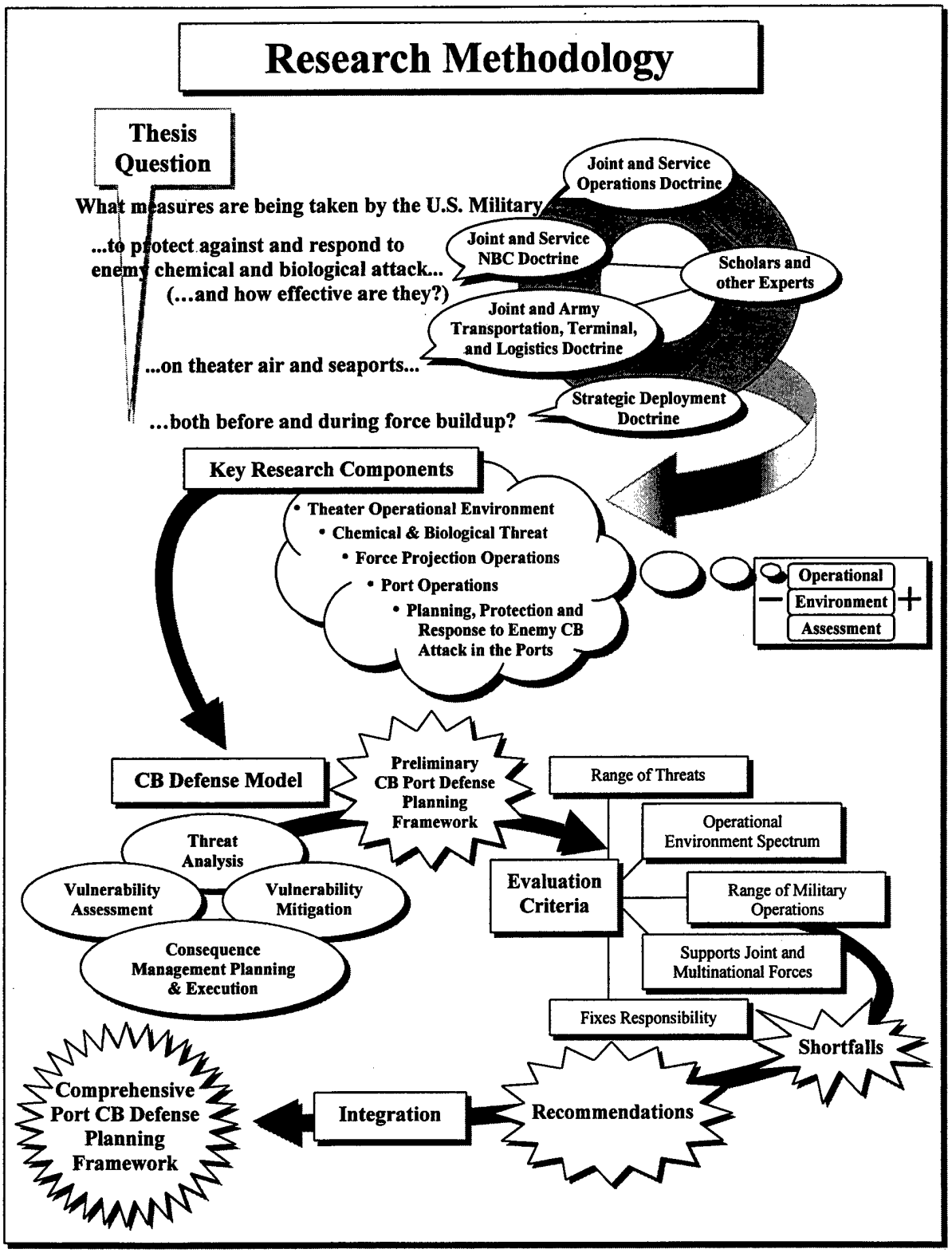
Research Methodology
Thesis Question
What measures are being taken by the U.S. Military
...to protect against and respond to enemy chemical and biological attack...
(...and how effective are they?)
...on theater air and seaports...
...both before and during force buildup?
Joint and Service Operations Doctrine
Joint and Service NBC Doctrine
Scholars and other Experts
Joint and Army Transportation, Terminal, and Logistics Doctrine
Strategic Deployment Doctrine
Key Research Components
• Theater Operational Environment
• Chemical & Biological Threat
• Force Projection Operations
• Port Operations
• Planning, Protection and Response to Enemy CB Attack in the Ports
Operational Environment Assessment
CB Defense Model
Preliminary CB Port Defense Planning Framework
Range of Threats
Operational Environment Spectrum
Threat Analysis
Vulnerability Assessment
Vulnerability Mitigation
Consequence Management Planning & Execution
Evaluation Criteria
Range of Military Operations
Supports Joint and Multinational Forces
Fixes Responsibility
Shortfalls
Recommendations
Integration
Comprehensive Port CB Defense Planning Framework

Figure 15.

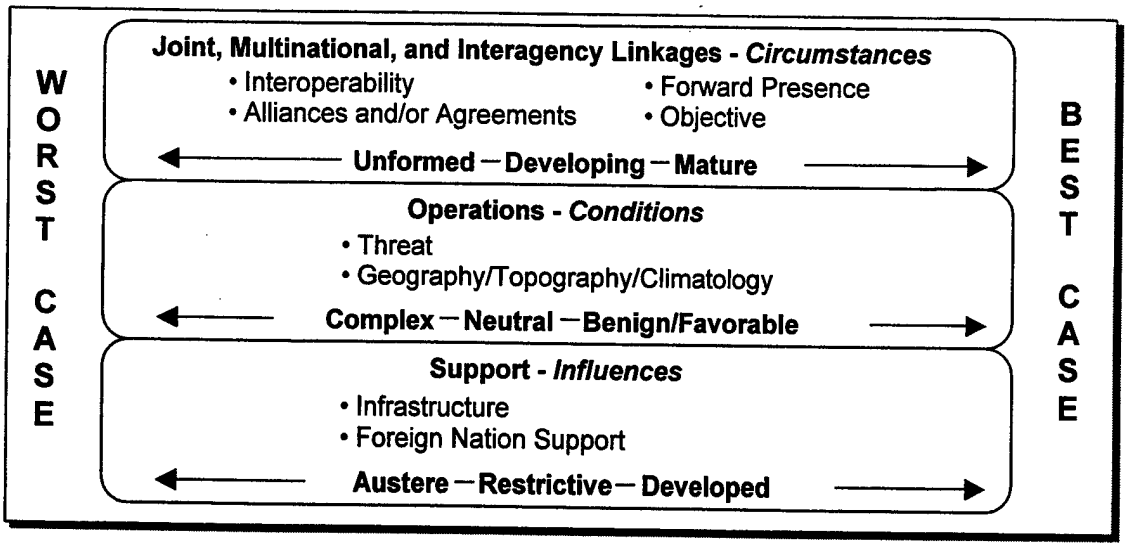

Figure 16. Operational Environment Assessment Model. Source: Army Field Manual 100-7, *Decisive Force: The Army in Theater Operations*, p. 2-28.

All doctrine and literature linked to threat analysis is first evaluated against the five criteria. Any time the evaluation uncovers inadequacies, a shortfall is designated. Recommendations to shortfalls are developed based upon the information garnered from the key research component process. For example, if nuclear, biological, and chemical (NBC) defense doctrine offers a weak threat analysis process, recommendations for solutions will be sought out from Army or joint intelligence doctrine. Likewise, if NBC defense doctrine fails to articulate the complexity of port operations within the context of CB decontamination, solutions will be sought out from Army or joint transportation doctrine. This same evaluation process will continue through vulnerability assessment, vulnerability mitigation and consequence management planning and execution. The shortfalls are the basis for the conclusions and recommendations in chapter 5.

The key research components are vital because they establish the information base necessary to validate conclusions and recommendations. Joint, operational, service,

and branch-specific doctrines all contribute to the thorough analysis of the research components and the CB defense model. Literature in the areas of military operations, intelligence, logistics, transportation, port operations, air defense, and chemical defense was collected and will be evaluated to form fact-based conclusions and judgements on the effectiveness of chemical protective measures. The inclusion of all these literature sources establishes the frame of reference necessary to support the declaration of a shortfall and the credibility of a recommendation.

Integration of Literature

Neither doctrine nor scholarly works adequately address all aspects of CB defense in the ports before and during force buildup. However, the integration of applicable measures derived from those sources can serve to formulate the primary framework that addresses the planning for, protection from, and response to CB attack in those strategic locations. This is the basis for the development of a comprehensive port CB defense planning framework. The evaluation of the literature falls in the sequence of the CB defense model: (1) threat analysis, (2) vulnerability assessment, (3) vulnerability mitigation, and (4) consequence management planning and execution. Chapter 4 concludes with a recapitulation of the shortfalls within the areas above. This sets the direction for the final thesis chapter that covers conclusions and recommendations for an integrated port CB defense and consequence management plan.

Conclusions and Recommendations

The focus of chapter 5 is on the shortfalls of CB defense doctrine at strategic ports before and during force projection operations. This last chapter focuses on validated shortfalls (conclusions) and integrates recommended solutions with the preliminary framework established in chapter 4. As a final product, chapter 5 offers a comprehensive port CB defense model that integrates all applicable elements of joint, operational, service, and branch-specific doctrine.

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[1]Department of the Army, Field Manual 100-7, *Decisive Force: The Army in Theater Operations* (Washington, DC: U.S. Government Printing Office, 1995), 2-28.

CHAPTER 4

LITERATURE EVALUATION

Introduction

The research methodology is centrally focused on the collection and review of literature that provides context and reference for the development of a model that facilitates evaluation of chemical and biological (CB) defensive and consequence management actions at strategic theater ports. This model, referred to as the port CB defense model, includes the tenets of threat analysis, vulnerability assessment, mitigation, and consequence management planning and execution. Throughout this chapter, support for this model comes from significant reference to a variety of key publications listed below.

1. Joint Publication 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense Operations*
2. Army Field Manual 100-7, *Decisive Force: The Army in Theater Operations*
3. Army Field Manual 100-5, *Operations*
4. Army Field Manual 34-130, *Intelligence Preparation of the Battlefield*
5. Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed Sites, Ports and Airfields*
6. Army Field Manual 3-5, *NBC Decontamination*
7. Army Field Manual 44-85, *Patriot Battalion and Battery Operations*
8. Army Field Manual 55-60, *Army Terminal Operations*
9. The Joint Staff, J8, *The CB 2010 Study*

The thesis question, What measures are being taken by the U.S. military to protect against and respond to enemy chemical and biological attack on theater air and seaports both before and during force buildup and how effective are those measures? can be answered, in large part, with a comprehensive evaluation of all CB defensive and consequence management procedures relative to strategic ports, force projection, and the operational environment. The evaluation criteria analyzes today's literature to determine if the U.S. military is taking necessary and effective measures for the defense against and recovery from an enemy CB attack on aerial and seaports of debarkation (APOD/SPOD) during initial entry phase of force projection operations.

If U.S. military forces are to respond worldwide to crises that span the full range of military operations, CB defensive and consequence management procedures must be applicable to a multitude of threats, operational environments, and military operations as they occur across a wide range of conditions, influences, and circumstances. The evaluation of all procedures must determine if responsibility for planning and execution is clearly fixed at appropriate levels of command. Finally, the evaluation must seek to determine if adequate and effective procedures are established for the consequence management of a CB attack occurring across a range of military operations in ports within theaters of varying degrees of host nation and military maturity.

The criteria used to evaluate the CB defense model components are depicted in figure 17, Evaluation Criteria. The diagram at figure 18, Evaluation Linkage, visually portrays the framework for the layout of the literature evaluation in this chapter. United States military forces can be subject to a range of varied threats as they respond to missions worldwide. The CB defense of ports, to include the consequence management

procedures following a CB attack, must address threats that range from terrorism and insurgency to rogue regime and peer opponent or nation state. An evaluation of the procedures associated with threat analysis, vulnerability assessment, mitigation, and consequence management planning and execution reveal both strengths and weakness in their applicability to a range of threats.

Criteria	Scope
Applicable Across a Range of Threats	• Peer Opponent/Nation State • Insurgency • Rogue Regime • Terrorism
Applicable Across the Operational Environment Spectrum	• Austere Host Nation/Theater • No Forward Military Presence • Mature Host Nation/Theater • Existing Forward Military Presence
Supports Application Across a Range of Military Operations	• Major Theater War (MTW) • Military Strikes and Raids (MS&R) • Peace Enforcement/Peace Keeping (PE/PKO) • Support to Insurgency (SPT INS)
Supports Joint and Multinational Forces	• Army – Navy – Air Force – Marines • Allied Military Forces • Host Nation
Fixes Responsibility	• U.S. Military Commanders • Allied or Host Nation Military Leaders

Figure 17. Evaluation Criteria

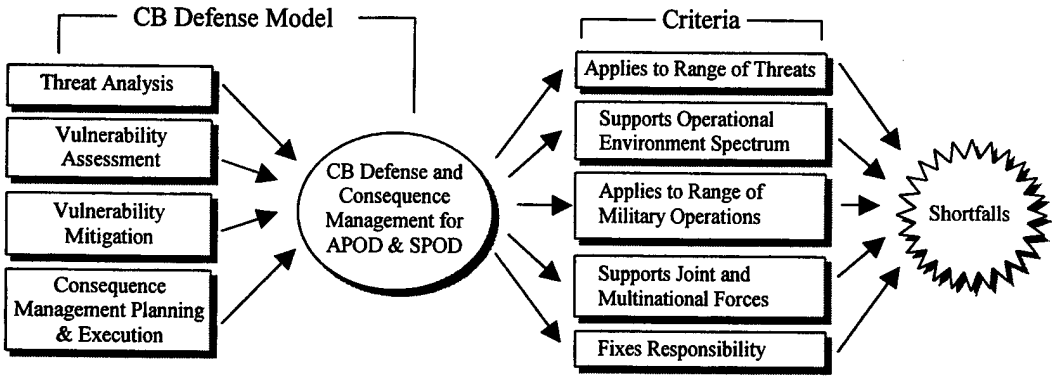

Figure 18. Evaluation Linkage

Just as U.S. forces are subject to facing a range of threats, so too are they subject to variety of operational environments ranging from austere, with little to no host nation/theater infrastructure or forward military presence, to mature, complete with fully developed infrastructures and some level of U.S. military presence. The CB defense of ports, to include consequence management procedures following CB attack, must address the challenges posed by the level of environmental maturity and forward military presence. This second criterion addresses how well threat analysis, vulnerability assessment, mitigation procedures, and consequence management planning and execution respond to the dynamics of each of these operational environments.

Chemical and biological defense and consequence management actions must be adaptable to a range of military operations within the joint and multinational environments. This evaluation considers Major Theater War (MTW), Military Strikes and Raids (MS&R), Peace Enforcement/Peace Keeping Operations (PE/PKO), and Support to Insurgencies (SPT INS). Additionally, the downsizing of the U.S. military during the 1990's has made each of the services more dependent upon one another in responding to crises worldwide. Past experience with Operations DESERT SHIELD and DESERT STORM, Operation RESTORE HOPE in Somalia and current operations in Bosnia emphasize the need for joint and multinational force interoperability. Port CB defense and consequence management actions must include measures to protect the entire force--army, navy, air force, marines, civil-military personnel, and allied foreign military forces.

Tenet 1: Threat Analysis

Threat analysis for CB defense planners is termed Nuclear, Biological, Chemical (NBC) Joint Intelligence Preparation of the Battlefield (JIPB). The NBC JIPB is a process that assists in the analysis of the threat and threat environment much in the same way as do the operational environment models discussed in chapter 2. The similarities include defining the battlespace environment, describing the battlespace effects, and evaluating the adversary, in particular, the threat CB capability and intent.

A shortfall of the NBC JIPB process is its tendency to focus analysis largely on the peer opponent, nation state, or rogue regime threat in the context of a tactical battlefield environment. Illustrations of this tendency are present in all components of the NBC JIPB process. There is no effort to define the threat in terms of terrorist or insurgent organizations, capabilities and intent. A failure to analyze terrorist or insurgent CB threat potential could easily lead to a failure to mitigate or recover from their effects. In step one, defining the battlespace environment, emphasis is placed on identifying all adversary countries and belligerents with known or suspected CB capability to include locations of delivery platforms (bombs, artillery, missile, aircraft, generator).[1] In step two, define the battlespace effects, emphasis is placed on evaluating adversary CB weapon systems by drawing maximum range arcs for rockets, missiles, and artillery. Similar emphasis is placed on identifying enemy air avenues of approach for CB weapon delivery by fast moving aircraft.[2] In step three, evaluate the adversary, additional emphasis is placed on delivery system ranges; a determination if enemy NBC employment doctrine is terrain oriented, force oriented, or both; and finally, reliance on the J2's doctrinal template.[3] In the final step, determine adversary course of action, the

planner is told to look for friendly targets within range of enemy delivery systems consistent with his employment doctrine and the J2's situation and event templates.[4]

The proliferation of weapons of mass destruction (WMD) has afforded CB weapon capability to a number of groups ranging from terrorist organizations to Third World nations. The Tokyo subway sarin gas attack on 20 March 1995, which killed twelve and injured over five thousand, indicates the degree to which CB threat has mutated.[5] Unless insurgents and terrorists are included in the CB threat analysis equation, complete with political affiliations, motivations, goals and intents that drive their actions, mitigation and recovery shortfalls may occur. The six weapons employed in the Tokyo subway gas attack were unconventional, disguised as a soft drink can, a briefcase, and a gas can wrapped in newspaper.[6] These "weapon systems" are not what the NBC JIPB leads someone to anticipate. If all threats are considered, they can be mitigated. However, a port infiltration by terrorists or insurgents, disguised as host nation contractors and armed with "food containers" containing the morning meals, could easily render a maneuver brigade's worth of soldiers combat ineffective.

The NBC JIPB provides a solid framework for defining the maturity of the operational environment. The environmental assessment models presented in chapter 2 all emphasize the necessity of thorough analysis to determine parameters of U.S. military requirements. The Operational Environment Assessment Model at figure 19 is designed to allow commanders and staffs to analyze the environment and assign a cumulative level of maturity, described as austere, restrictive, or developed, to the circumstances, influences, and conditions.[7] It does not provide any subsequent model to assess the

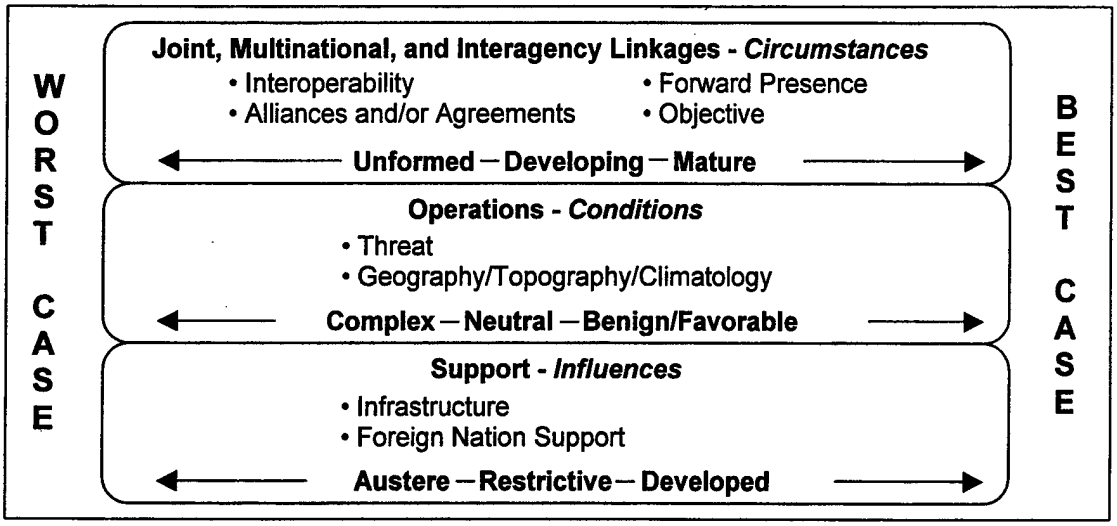

Figure 19. Operational Environment Assessment Model. Source: Army Field Manual 100-7: *Decisive Force: The Army in Theater Operations*, p. 2-28.

impact of threat capabilities, intentions, and objectives based upon the environmental maturity determination. For example, does forward U.S. military presence in a developed allied nation deter a rogue regime from conducting pre-emptive CB strikes on the ports of that nation? If so, does that rogue regime opt for a more covert CB attack plan such as terrorism? If so, will the targets include U.S. military personnel and equipment at port or host nation facilities in port?

Different military operations also raise new questions on threat intent and possible courses of action. The NBC JIPB, with its accompanying Detailed Threat Analysis and Plans Checklist, provides a framework for thorough analysis of threat CB capabilities for a major theater war (MTW) but must be adapted to provide overarching applicability for operations such as military strikes and raids, peace enforcement/peace keeping, and support to insurgencies. While these other operations may not involve the concentration of forces at ports, planners must consider the effect of the operation on threat CB intent

and objective with regard to the vulnerability of U.S. or allied forces forward deployed to ports within threat CB strike range.

A military strike or raid is a limited offensive operation into enemy territory or airspace for the purpose of destroying enemy installations; capturing or freeing prisoners; or disrupting enemy command, control or support functions.[8] The intelligence preparation of the battlefield (IPB) for a military strike or raid must consider the possibility of the targeted organization striking an element other than the attacking or raiding force as an act of retaliation.[9]

Peacekeeping and peace enforcement operations place military forces in potentially tenuous political situations for the purpose of separating belligerent groups or nations.[10] Like the previous example, planners must consider the possibility of terrorist and other belligerent actions striking key targets that prevent peacekeepers or peace enforcers from achieving the desired political end state.[11] Uprisings against oppressive regimes that work against U.S. interests are called insurgencies and are selectively, and usually covertly, supported by special operations forces (SOF).[12] Sophisticated weaponry in the hands of terrorists or insurgents is an indicator of external support as well as the capability to attack well protected and more sophisticated targets. Capability and external support coupled with an evaluation of the enemy leadership's personalities may provide an indication of willingness to employ CB weapons.[13]

The NBC JIPB is a comprehensive and continuous process. In its current form, it focuses planners on MTW operations and provides vast checklists to supplement threat analysis. As an NBC planner tries to adapt the voluminous NBC JIPB to smaller scale military operations, it is likely that, without the aid of an astute intelligence officer,

possible threat CB courses of action will be overlooked. As weapons of mass destruction continue to proliferate, the probability that U.S. forces will face a CB threat in any operation increases.

By its own title, the NBC JIPB is a joint process. It is used by joint intelligence organizations to produce intelligence assessments, estimates, and other products in support of the joint force commander's (JFC) decision-making process.[14] Of the four steps that comprise the process, step two, defining the battlespace effects, contains the bulk of the joint force considerations. Some of the most critical considerations are illustrated at figure 20, NBC JIPB: Battlespace Effects.[15] Since none of the four steps make any reference to multinational forces, the impression is created that this process is weak in that area. The only link to multinational force considerations is found in The

NBC JIPB: Define Battlespace Effects

- Identify and assess the vulnerability of key logistics facilities and infrastructure to NBC attack
- Analyze land and maritime surface dimensions to identify potential target areas for NBC attack such as:
  - Choke Points
  - Key Terrain
  - Transportation Nodes
- Using the J-2's maritime and littoral analysis, conduct a detailed maritime littoral analysis to determine NBC weapon effects on operations. This is done by visualizing NBC effects on naval operations by combining the J-2's terrain analysis products with weather effects and analyzing the effects of enemy CB weapons.
- Crosswalk the terrain, maritime and littoral NBC analyses examining any crossover effects (i.e. any terrain effects that affect maritime operations, etc.).

Figure 20.

Detailed Threat Analysis and Plans Checklist located in Appendix I of Joint Publication 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical Defense Operations*. This is a lengthy checklist that does direct planners to consider the effects of CB weapon use on multinational forces.

Joint Publication 3-11, *Joint Doctrine for Nuclear, Biological, and Chemical Defense Operations,* is very thorough in assigning responsibilities for threat analysis. A subset of the NBC JIPB, threat analysis is the responsibility of staffs and commanders at all levels. Figure 21 is a suggested Joint NBC Cell configuration.[16] The future operations section is the primary agent for NBC JIPB. This section must work with the J2 Intelligence Section to identify enemy capabilities and potential courses of action which serve as the basis for vulnerability analysis, mitigation, and consequence management.

Overall, the literature available, primarily doctrine, offers a solid framework for the performance of threat analysis. The NBC JIPB process has strong links to joint and multinational operations and establishes clear responsibilities for threat analysis. Its lengthy process places heavy emphasis on major theater war and the associated sophisticated threat forces such as the peer opponent or nation state or rogue regime. There is little focus on threat analysis for smaller scale operations such as military raids and strikes, peace enforcement, and support to insurgencies. In general, there is a large shortfall in analysis framework for terrorist, insurgent, and unconventional warfare CB threat potentials. This shortfall is extremely alarming within the context of strategic port vulnerability. Both the smaller scale military operations and the unconventional CB

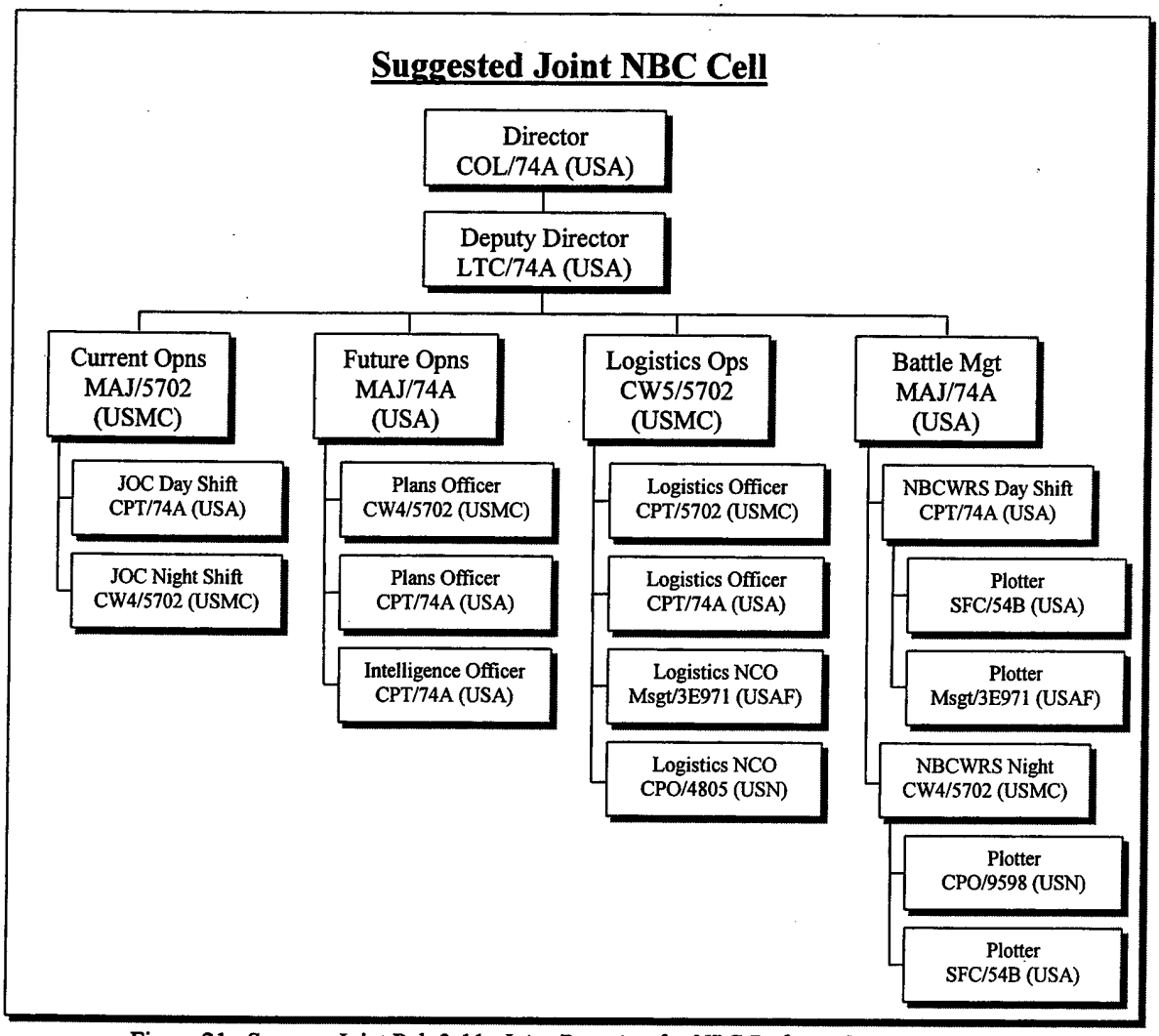

Figure 21. Source: Joint Pub 3-11, *Joint Doctrine for NBC Defense Operations*, p. I-1.

threat potentials have unique threat analysis considerations that, if omitted from the NBC JIPB, can leave U.S. and coalition force vulnerabilities uncovered.

Tenet 2: Port Vulnerability Analysis

It is the enemy's ability to deliver CB weapons that cause commanders and staffs to conduct vulnerability analysis. Recognizing that certain targets within the port

environments, such as joint, multinational, host nation and civilian personnel and equipment, are vulnerable to CB attack allows planners to wargame weapon system effects against those targets. Vulnerability analysis fails to examine the potential effects of terrorist or insurgent CB attacks on ports. Moreover, procedures for vulnerability analysis of CB attack on ports by any range of threats, during force projection operations, are simply nonexistent. Procedures must either be adapted from procedures developed for conventional battlefield environments or developed under new criteria that provide a quantifiable effect analysis on personnel, equipment and operations. Both Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields*, and Joint Publication 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations,* provide useful risk assessment models and casualty formulas for conventional CB threat delivery systems that offer some adaptability to a port environment.

When threat analysis fails to consider the potential for terrorist-delivered CB attacks on a port, no conclusion is drawn by NBC defense planners that a vulnerability exists. Strategic ports are high value targets for both terrorists and peer opponents. The vulnerability of all the critical nodes at the port must be assessed against the threat CB weapon systems of terrorists, insurgents, rogue regimes, and peer opponents/nation states. Some of these critical nodes include strategic lift assets (planes and ships), docks, runways and ramps, off-loading sites, material handling equipment, marshalling and staging areas, cargo, supplies and combat equipment, troop life-support facilities, civilian workers, and command and control cells. An analysis of the vulnerability of these nodes

against a range of threats, each with their own array of CB weapon systems, facilitates the development of mitigation procedures.

Tactical vulnerability analysis is essentially determined by the calculation of downwind hazard areas created by enemy CB weapon attack and the effect of that hazard on military forces within that hazard area. In an austere theater where U.S. and other military forces debark over bare beaches, the environment is essentially tactical and therefore lends itself to the vulnerability assessment process described above. In an environment with mature port infrastructure, enemy target selection options and CB weapon effect potentials increase. Of particular concern are the critical nodes of ports, both air and sea, and the host nation civilian port work force, which, as doctrine recognizes, must be protected from the effects of a CB attack.[17] What doctrine does not do is provide a method to assess the effects of CB attack on ports of varying maturity. The current doctrinal procedures outlined in Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields*, describe a tactical CB vulnerability assessment process that can be adapted to austere port environments. However, there is no similar process for assessing the vulnerability of targets and operations in a developed port environment.

In an MTW, where ports are integral to the success of military operations, doctrine does recognize that those facilities, to include the military and civilian forces debarking through them, are vulnerable to CB attack. Port operations center around a variety of critical mission functions that must be protected. These functions are illustrated at figure 22.[18] The use of CB weapons on ports could have a more severe and damaging impact on the outcome of an MTW than on any other military operation.[19]

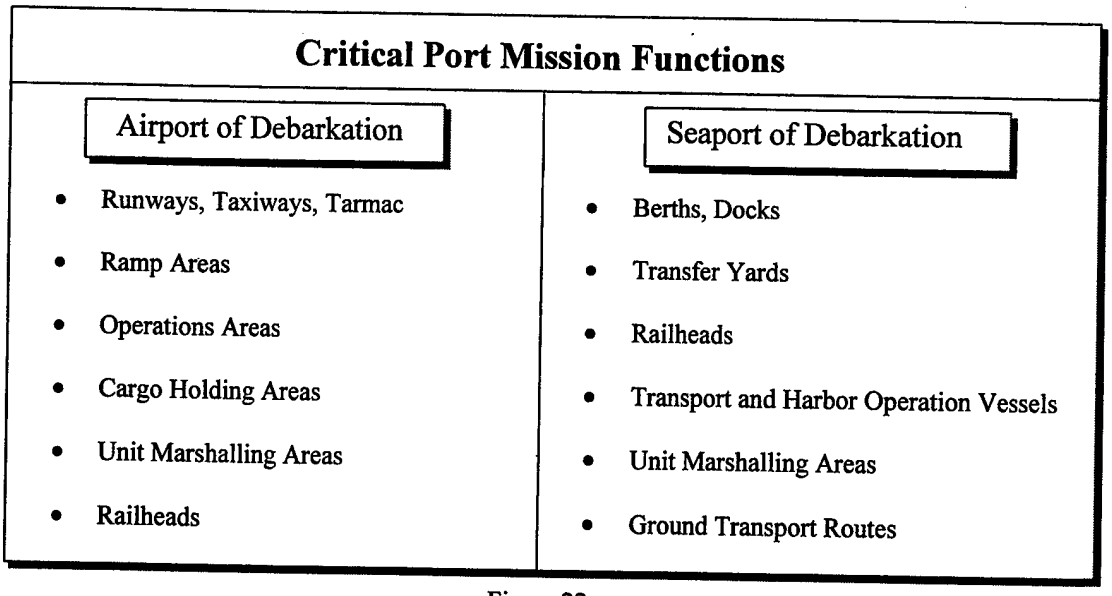

Figure 22.

However, this general conclusion represents the depth of detail to which chemical defense doctrine describes the effects of CB attack on port and military operations. With regard to military strikes and raids, peace enforcement, and support to insurgencies, doctrine does not even attempt to address potential port vulnerabilities. During the evaluation of threat analysis, it was established that retaliation and terrorism are likely manifestations of threat response during those operations. Threat analysis must be refined to determine port vulnerability to CB attack within the context of these lesser intensive military operations.

Vulnerability analysis does not offer a quantifiable effect analysis on port mission functions. The only link to joint and multinational applicability is the fact that aviation, naval and ground personnel and equipment, plus the operations of strategic lift and reception, staging, onward movement and integration (RSOI), have been recognized as vulnerable to the effects of CB attack. Models must be developed to quantify the effects

of CB weapons delivered by a range of threats on each component of the joint, multinational, host nation and civilian force. Only then can adequate mitigation and consequence management procedures be planned and executed.

The responsibility for conducting vulnerability analysis lies with commanders and staffs at all levels. As in threat analysis, the J3 NBC future operations section performs this task and disseminates this information, as part of the operation plan or order, to subordinate commanders and staffs as guidance for the implementation of mitigation and consequence management procedures. However, given the lack of doctrinal procedure for conducting port vulnerability analysis, the J3 cell is faced with adapting inadequate procedures to a complex environment.

As a general process, vulnerability analysis focuses on the sophisticated or peer opponent threat and ignores potential CB attacks from terrorism, insurgency, or other unconventional warfare operations. In calculating CB attack effects on personnel, doctrine prescribes procedures for quantitative analysis primarily suited to a tactical battlefield environment. Those procedures could be adapted to austere theaters or ports but are far too inadequate for application to fully developed port environments. The effects of CB attacks on ports during an MTW are couched in broad terms when describing strategic lift and RSOI operations. Vulnerability analysis doctrine must undergo a transformation to provide separate models for quantitative effect analysis based upon a range of threats, environments and military operations in joint and multinational environments.

Tenet 3: Mitigation

Despite the noted weaknesses in CB vulnerability assessment, Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields,* offers a lengthy list of tactically oriented CB defense measures that can be adapted to port CB defense. The numerous options for vulnerability mitigation are classified as either counter-force, active or passive defensive measures. Most of those measures fall under the category of passive defense. To avoid confusion during the evaluation process, reference is made to the lengthy list of mitigation measures as tactical passive, operational passive, and strategic passive, as illustrated in figure 23.[20] These sub-classification titles are not doctrinal terms and are only intended to discern specific mitigation measures during the evaluation process. Deterrence options, counter-force, and other active measures are illustrated at figure 24.[21]

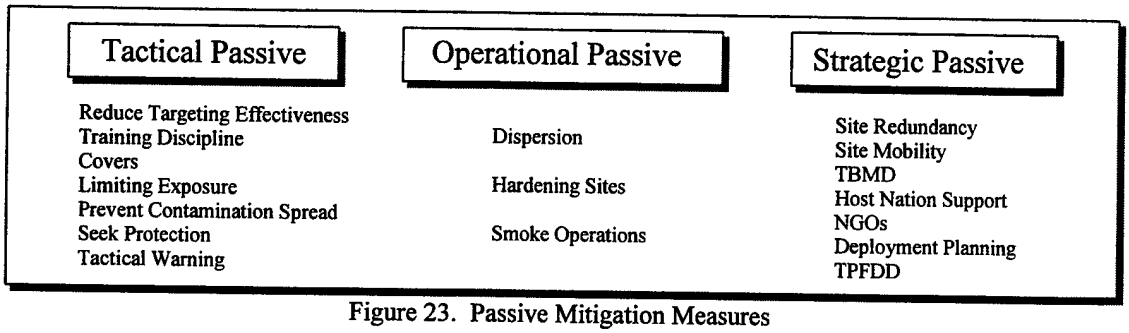

Figure 23. Passive Mitigation Measures

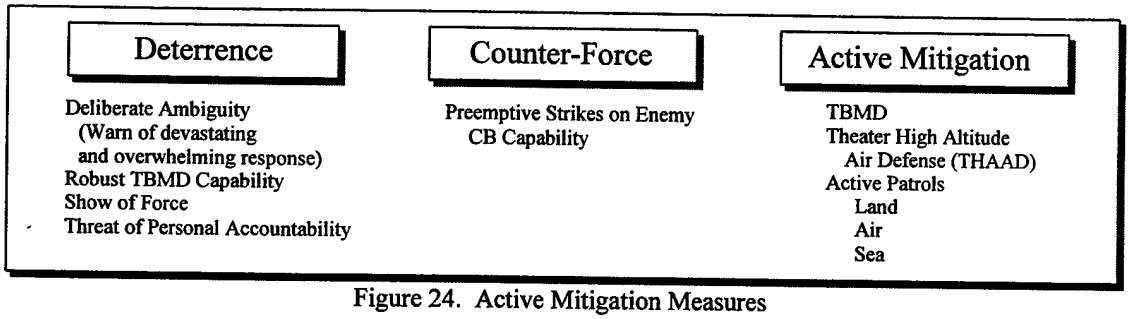

Figure 24. Active Mitigation Measures

Overall, the doctrinal mitigation measures are strongly adaptable to the range of threats. The doctrinal mitigation techniques listed in both Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields,* and Joint Publication 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations*, evolved from the mitigation measures originally developed for battlefield NBC defense against a peer opponent threat possessing rocket-, missile-, artillery-, and aircraft-delivered CB weapons. The use of civil affairs and psychological operations units in conjunction with host nation police is the only mention of mitigation against terrorist, unconventional warfare or insurgent threats.[22] With a little imagination, many of the passive mitigation measures can be adapted to these potential CB threats. The *CB 2010 Study* postulated terrorists pumping liquid nerve or blister agents from the back of a "delivery truck" directly onto the road networks just outside the air or seaports resulting in casualties, panic and a disruption of operations.[23] In the Tokyo subway gas attack, the CB weapons were disguised as harmless soda cans or briefcases that, in plain view, aroused no suspicions before casualties mounted. Effective mitigation of these threats requires that the terminology defining these measures be modified to incorporate the language that describes port organization and operation. Specific measures suitable for incorporation to the existing passive defense techniques can include heightened local security, increased stand off distances, and aggressive patrolling.

In terms of applicability to the various operational environments, arguably all of the mitigation measures are linked primarily to austere environments since they have their origins rooted in tactical battlefield applications. Forces entering a mature theater with modern port facilities must adapt those mitigation measures to reflect the

Host Nation Assets

Source		Function
Police Department	—	Security operations, refugee handling, traffic control, civil order
Fire Department	—	High pressure water dispensing equipment, hoses
Civil Defense	—	Trained personnel, detection equipment, materials
Water Department	—	Large quantities of water
Water Treatment Plant	—	Source of decontaminants
Sanitation Department	—	Trained personnel to handle hazardous waste, disposal of nonpersistent material
Environmental Control	—	Hazardous material monitoring, reduction, and disposal
Local Construction Companies	—	Earth moving equipment, MHE
Local Retailers	—	Covers, expendable supplies, decontaminants
Multinational Companies	—	Source for miscellaneous assets

Figure 25.

vulnerability of critical port mission functions. With a mature theater, host nation infrastructure is expected to be capable of providing resources and manpower to mitigate threats. Some of these host nation assets are illustrated at figure 25.[24] A significant shortfall of Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields*, is that it is written from the perspective that military forces have closed in theater and have occupied the full depth of the battlefield. As a result of this perspective, there are no mitigation procedures for CB attack on the critical nodes of mature ports in absence of U.S. or allied military presence. This requires that

the host nation execute active and passive CB defense until U.S. or other allied military forces can be deployed to mitigate the threat.

Similarly, the multitude of strategic, operational, and passive defense measures presented in Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields*, are geared for mitigation of a CB threat that is rated as high and sophisticated. This likely equates to a MTW characterized by high intensity, large-scale combat operations. For missions of lesser intensity and CB threat, the mitigation measures can, presumably, be reengineered for lower intensity combat and threat. Threat and vulnerability analysis doctrine spends little time applying procedures to military strikes and raids, and peacekeeping operations. Consequently, the mitigation measures do not directly address operations less than an MTW. Since Operation DESERT STORM ended in 1991, there has not been another MTW for the U.S. military.

There have been several smaller scale operations to include military strikes and raids on Sudan, Afghanistan, and Iraq in 1998; peace enforcement in Bosnia, and peace keeping in Macedonia, both ongoing today. In 100 percent of the deployments since Operation DESERT STORM, forces always debarked into a port to facilitate the conduct of operations less than an MTW. When these deployments place U.S. forces under the CB threat umbrella of hostile nations, that, coupled with the proliferation of WMD, offers compelling reasons for the development of adaptable CB threat mitigation measures over a range of operations.

The mitigation measures at the strategic and operational levels offer some degree of joint and multinational applicability. Most notably is the need, in many cases, for active defense in the form of theater ballistic missile defense (TBMD). Neither FM 3-4-1

nor Joint Publication 3-11 discuss the requirements for umbrella coverage over strategic ports. Reduction of targeting effectiveness, dispersion, site redundancy and mobility are key mitigation measures that offer linkage to joint and multinational applications. However, none of the doctrine or literature discuss peculiar vulnerabilities unique to the services other than the ships and aircraft. Until all joint vulnerabilities are understood, the development of Navy-, Air Force- and Marine Corps-specific mitigation measures will remain the responsibility of the joint planners.

Mitigation measures described by chemical defense doctrine lack specific linkage to the mission of port defense and the range of CB threats. However, given the flexibility and multitude of passive CB defense measures, many of these procedures can be adapted to a range of circumstances, influences, and conditions. Mitigation measures have their origins in tactical battlefield defense against a peer opponent or nation state threat. There is some discussion on employing civil affairs and psychological operations units, in conjunction with host nation law enforcement, to mitigate the terrorist and insurgent-type threats. Arguably, mitigation measures are evolving to support applicability to other than the austere, battlefield-type environment. However, port mission functions, whether in a mature or austere environment, are not articulated among any of the passive or active mitigation measures.

An even more significant shortfall is the fact that the premier doctrinal publication for port defense, Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields*, is written from the perspective that all military forces have closed in on the theater in time to employ measures to mitigate the CB threat and execute consequence management. Outside of deterrence and TBMD, options are

extremely limited on how to mitigate the CB threat facing ports prior to the introduction of U.S. forces. If the U.S. is embarking on an MTW, this is a significant concern for which planners must address at the strategic national and strategic theater levels of operation. Presumably, current measures can be implemented by the host nation forces in a mature theater for both an MTW and other less intensive offensive military operations.

Some of the strategic and operational passive defense measures have a natural applicability to support joint and multinational operations. Reducing targeting effectiveness, dispersion, site redundancy, mobility, and TBMD are broad concepts easily adaptable by the joint services as they conduct joint and multinational operations. Since vulnerability assessment lacks details on service-specific concerns, mitigation measures have yet to be addressed. When vulnerability mitigation measures leave shortfalls across a range of threats, operational environments, and joint and multinational military operations, the resulting challenge is an increase in meeting unforeseen consequence management requirements.

Tenet 4: Consequence Management

Consequence management is defined as those actions taken to organize, train and equip response forces for the defense of and recovery from the effects of a CB attack.[25] This section will discuss and evaluate doctrinal fixed-site CB defense planning and doctrinal fixed-site post-attack response and recovery. While JIPB is part of the planning process, this evaluation will focus on the CB defense planning that occurs in response to the defined CB threat. Doctrine offers very little guidance for the post-attack response and recovery of ports from CB attack but provides an extensive list of considerations for

fixed-site CB defense. Figure 26 outlines those fixed-site CB defense planning considerations and are listed in the order in which they are discussed.[26] The evaluation of post-attack response and recovery reviews the execution plans, the recommendations posed by decontamination challenges, and the decontamination decision-making processes.

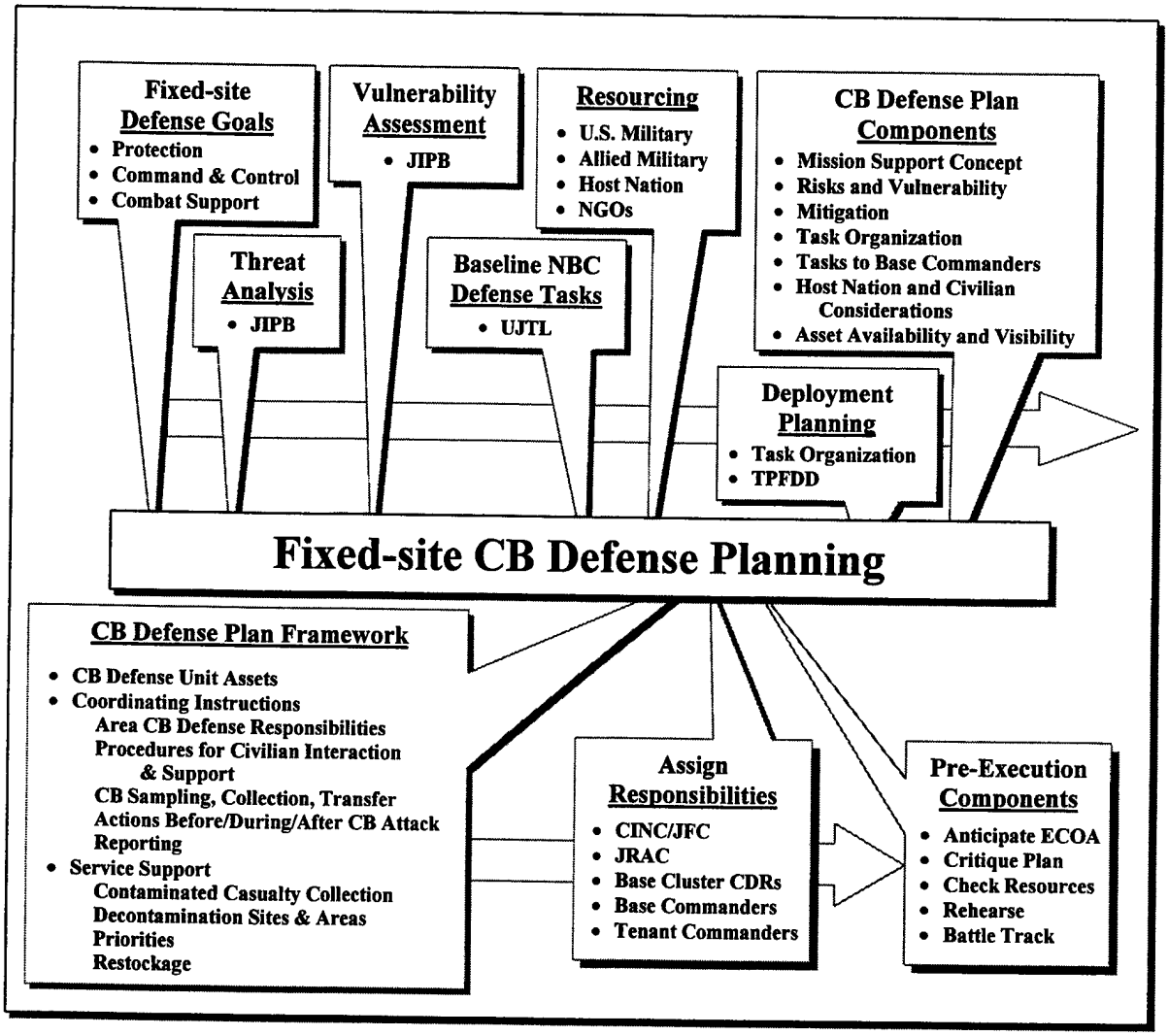

Figure 26.

The primary fixed-site defense goals are protection and sustainment of command and control and combat support.[27] The primary focus of Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields,* is to provide the designated Joint Rear Area Coordinator (JRAC), along with his base cluster and base commanders, with considerations for a fixed-site defense plan.[28] The tasks necessary for fixed-site defense originate from the CINC Joint Mission Essential Task List (JMETL) which, in most cases, is pre-established for a particular geographical contingency area.[29] Tasks with primary application on CB defense fall into the categories of Strategic Theater (ST), Operational (OP) and Tactical (TA). In the case of army chemical defense doctrine, the tactical tasks are referred to as Army Tactical (ART). Those baseline NBC defense tasks are listed in table 2.[30] While these tasks are not particular to any specific environment or military operation, they help the CINC/JFC determine theater CB defense missions. They are based upon the CB threat and establish a reference for resourcing, deployment planning, and CB defense plan development.

Resourcing includes identifying organizations, equipment and material in the appropriate quantities to satisfy mission requirements. The planning process does not provide a method to determine these quantities. In addition to recommending potential host nation asset and nongovernmental organization (NGO) capabilities, doctrine provides detailed listings of CB defense units and equipment for all U.S. service branches, North Atlantic Treaty Organization (NATO) member countries and other alliance-based countries.[31] Visibility on these assets and capabilities allows the CINC/JFC to begin deployment planning. The primary emphasis in this phase is task-organizing units to accomplish the CB defense missions and then programming the Time-

Phased Force Deployment List (TPFDL) which establishes the deployment sequence for units to meet mission priorities.[32]

Table 2. UJTL Baseline NBC Defense Tasks. Source: Joint Pub 3-11, *Joint Doctrine for NBC Defense Operations*, p. VI-5.

Baseline NBC Defense Strategic Theater Tasks

Task Number	Task	Implied Task
ST 4.3	Distribute Supplies/Services for Theater Campaign and COMMZ	• Establish Stockage Levels for NBC Equipment & Supplies • Develop Passive Missile Defense Plan • Manage the NBC Defense Battle - Assess Friendly/Enemy Capabilities - Reduce the Threat - Maintain Current/Predictive Situational Awareness - Maximize Force Effectiveness Enabling Tasks • Visualize the NBC Battlefield • Protect Against NBC Hazards • Conduct NBC Restoration Operations
ST 6.1.5	Provide Theater Missile Defense	
ST 6.2.8	Establish NBC Protection in Theater	

Baseline NBC Defense Operational Tasks

Task Number	Task	Supporting Task
OP 1.3.1	Overcome Operationally Significant Barriers, Obstacles, and Mines	• Bypass, Cross, Operate Within NBC Contaminated Areas • Provide Logistics Support in an NBC Environment • Provide NBC Protection • Develop Passive Missile Defense Plans • Assess NBC Threat • Develop Indicators of Use • Identify Potential NBC Weapons Locations • Predict Threat Use • Develop Hazard Estimates • Detect/Verify NBC Hazard • Analyze Risk • Optimize Use of NBC Defense Assets • Provide Joint NBC Warning and Reporting • Restore Forces After Attacks
OP 4.5	Manage Logistic Support in Theater/JOA	
OP 4.6	Build & Maintain Sustainment Bases	
OP 6.1.5	Conduct Operational Area Missile Defense	
OP 6.2.8	Establish NBC Protection In Theater/JOA	

Army Baseline NBC Defense Tactical Tasks

Task Number	Task	Supporting Task
ART 6.2	Protect Individuals and Systems	ART 6.2.1.4 Employ Protective Equipment ART 6.2.1.6 Provide NBC Protection to Friendly Forces ART 6.2.1.6.1 Employ Contamination Avoidance ART 6.2.1.6.2 Identify NBC Hazards ART 6.2.1.6.3 Warn Personnel/Units of Contaminated Areas ART 6.2.1.6.4 Report Hazards Throughout Battlespace ART 6.2.1.6.5 Use Individual/Collective NBC Protection ART 6.2.1.6.6 Employ Pretreatments/Prophylaxis and Have Immunizations up to date ART 6.2.2 Remove Battlespace Hazards ART 6.2.2.1 Decontaminate Personnel and Systems ART 6.2.2.1.1 Perform Immediate Decontamination ART 6.2.2.1.2 Perform Operational Decontamination ART 6.2.2.1.3 Perform Thorough Decontamination ART 6.2.2.1.4 Perform Patient Decontamination ART 6.2.3 Minimize Risk From Battlespace Hazards in Area of Operations

The fixed-site CB defense plan includes the threat and vulnerability assessment, mitigation measures, task organization, missions for military and host nation CB defense organizations, and the support concept.[33] The CINC/JFC establishes responsibilities for the joint rear area CB defense. Some of the key responsibilities for each level of command in the joint rear area are illustrated at figure 27. These responsibilities are

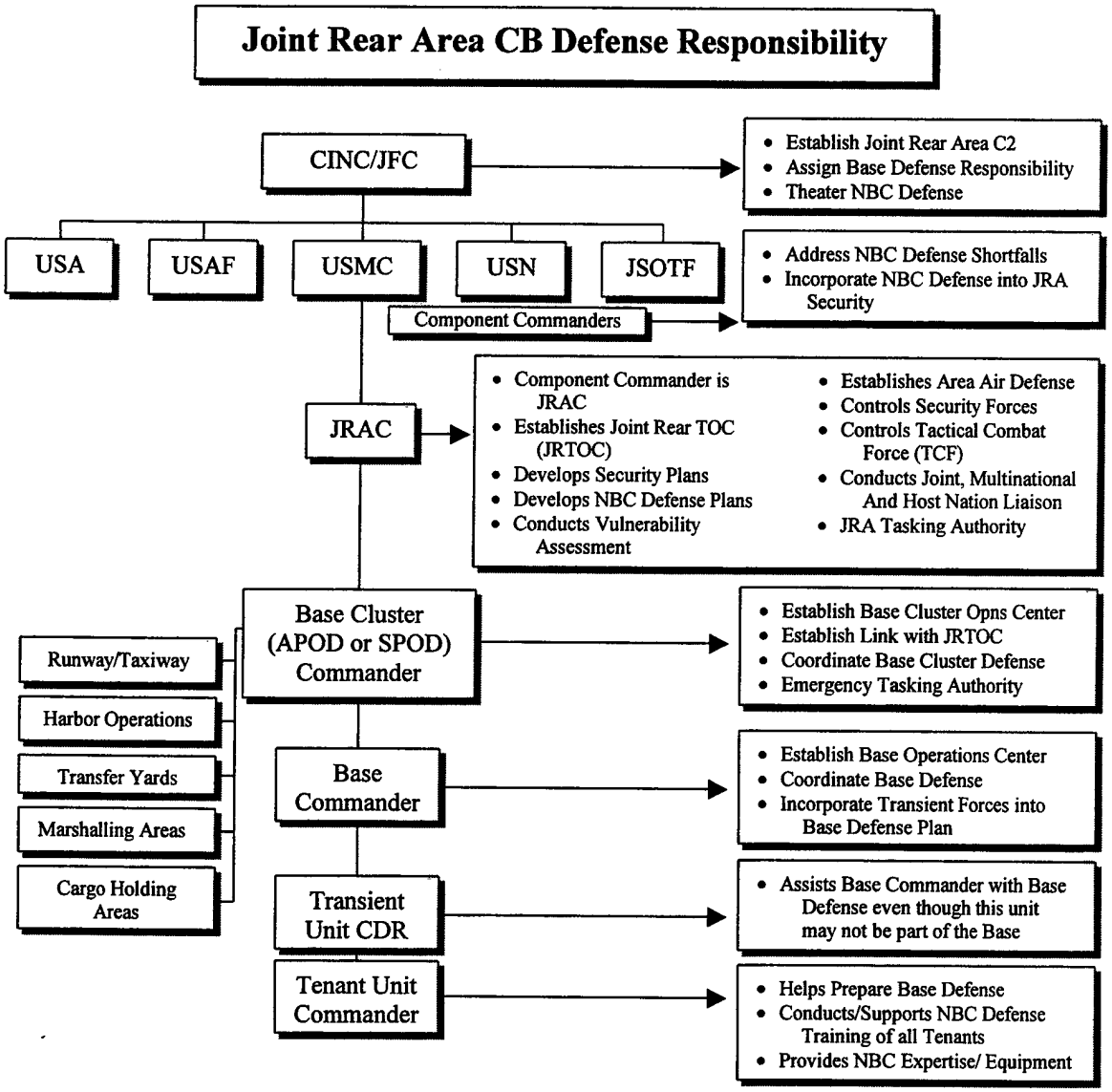

Figure 27.

incorporated into base defense orders at each level of command. Measures to support a successful CB defense plan include continual threat assessment and wargaming, resource verification, rehearsals and critiques of the plan.[34]

Post-attack response and recovery are dependent upon the successful execution of detailed CB defense plans. Warning and reporting procedures must be standardized and able to reach each individual at the fixed-site.[35] Concepts for smoke employment, CB detection, reconnaissance, and decontamination are arrayed against the enemy course of action, CINC/JFC priorities, and unit areas of responsibility.[36] Execution tasks must incorporate training and rehearsals and assign CB detection, reconnaissance, and decontamination tasks to specific units.[37] Coordinating instructions include the execution of passive mitigation measures plus contamination avoidance and control guidance, location of link-up points for decontamination operations and, lastly, medical protection.[38]

Support for the post-attack response and recovery plan must include CB casualty collection and patient decontamination points; decontaminant and chemical defense equipment consumption rates; supply priorities, locations and distribution schemes; and maintenance of CB defense equipment.[39] One characteristic of fixed-sites is the presence of transient and tenant units. Critical to the effective command and control of post-attack response and recovery is the warning and reporting system within the rear area command structure. Network diagrams portray information flow requirements, radio frequencies, and actions in response to alarms.[40]

The execution plans as explained above portray guidance considerations, from base chemical defense doctrine, within the framework of an operations order. There are

no established joint tactics, techniques and procedures (JTTP) for how a base commander, base cluster commander or port commander responds to preserve the critical port mission functions under his control. To illustrate the lack of definitive procedures, Joint Publication 3-11 relies on passive defensive measures at airports and offers the following recommendation for seaports:

> Ship, harbor operation vessels, and break-bulk cargo provide the most significant decon challenges at the SPOD. Based on mission requirements, RO/RO (roll on, roll off) equipment proceed along predetermined routes directly to designated assembly areas. Containerized cargo remains free of contamination and containers may only require decon around handling and entry areas. Current U.S. Navy procedures and copious amounts of seawater will restore ships and harbor vessels to an operational level of decon, but will not fully restore their crews' ability to operate without protective equipment. Unless mission critical, consider moving break-bulk cargo to a holding barge anchored in a designated isolation area. The manpower and time required to remove external packaging and to reconfigure the cargo, or to decon cargo without external shipping containers, should only be allocated by command directive (JFC/JRAC).[41]

Army Field Manual 3-5, *NBC Decontamination*, provides guidance, from an army perspective, on tactics, techniques, and procedures (TTP) for airfield, helipad, motor park, and terrain decontamination.[42] These TTPs emphasize the "how to" for the decontamination unit commander but do not offer guidance for the joint or operational level base commander. Appendix H, Fixed-site Decontamination, to Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports, and Airfields*, provides guidance, in the form of flow charts, to assist base commanders in deciding if and when to conduct decontamination.[43] These are rudimentary tools in that each flow chart asks the same basic questions: (1) Can the mission be accomplished without decontamination? (2) Can units be relocated or the contamination be bypassed? (3) Are there unnecessary risks in letting the contamination remain? and (4) Do we have the time

and resources to conduct decontamination? The planning and execution of CB defense, the recommendations in response to APOD/SPOD decontamination challenges, and the decontamination decision-making tools as discussed here represent the totality of guidance from which a base commander, base cluster commander, or port commander can plan and execute port CB defense and consequence management.

Analysis of the threat, friendly vulnerability, and the operational environment form the basis for planning and conducting CB defense. A port commander's CB defense and response plans must engage the range of threats defined by the NBC JIPB. The Uniform Joint Task List (UJTL), the source for the JMETL, contains all the tasks, from strategic to tactical, that address CB defense needs. For example, if a peer opponent or rogue regime possesses a CB ballistic missile capability, OP 6.1.5, Develop Missile Defense Plan, may counter that threat with Army Patriot missile systems.[44] The depth of the enemy CB ballistic missile capability plus the scope of friendly assets requiring ballistic missile defense (BMD) must be evaluated by planners and branch experts to determine the number of Patriot units and level of supply support needed to support those assets. This thought process applies to every CB defense task on the UJTL. However, the CB planning process does not offer considerations unique to range of threat probabilities.

The ballistic missile and air threat is primarily associated with the peer opponent and, in some cases, the rogue regime. Arguably, this is the focus of fixed-site CB defense planning. Army Field Manual 3-4-1 deliberately omits discussion of active and passive theater ballistic missile defense (TBMD) as a part of fixed-site CB protection because "fixed-site commanders probably have little or no direct control of active defense assets

capable of interdicting WMD delivery systems."[45] While this assumption may have some truth, its omission from the premier fixed-site CB defense manual devalues a critical command, control, and coordination link with the active defense asset that can assist the base cluster or port commander with his CB defense plan. For example, in planning CB defense and consequence management, the port commander needs to know if the Patriot battery mission is asset protection or area protection because it directly impacts on the probability of missile or aircraft penetration. In area protection, the BMD coverage is thinner and results in a greater probability that the port commander will have to execute a response mission.[46] If the BMD umbrella is thinner over some elements of the base or base cluster than others, then the port commander has a better idea of where he might have to concentrate or commit CB defense and recovery assets.

Terrorist or insurgent threats can exist either by themselves or as part of the unconventional warfare capability of a peer opponent, nation state, or rogue regime. Considering the *CB 2010 Study* and the 1995 Tokyo subway sarin gas attack, two resourcing shortfalls exist in the port CB defense planning process. The first is a capability to eliminate a CB-capable terrorist or insurgent threat element at the port and the second is the potential need for multiple passive CB detection devices near high payoff terrorist target sets. The seaport operator is a terminal transportation brigade (TTBde), as designated by Military Traffic Management Command (MTMC), and is responsible for developing port security plans that address protection from and response to air and missile attack, unconventional forces, sabotage, terrorism, mining, and espionage.[47] Transportation doctrine discusses the employment of port security companies within the reserve component that are trained for this mission yet chemical

doctrine makes no mention of employing such a force with host nation agencies to defend against terrorist CB threat.[48] Secondly, both airport and seaport critical mission functions can be dispersed over large geographical areas creating a vulnerability to terrorist or unconventional force infiltration. These terrorist or unconventional forces will employ CB devices to cause casualties and disrupt critical mission functions while our detection assets focus on TBM or aircraft-delivered CB weapons.

The operational environment poses challenges to current doctrinal CB defense and consequence management. Prior to Iraq's invasion of Kuwait in August 1990, there were no forward-deployed U.S. military conventional forces in either Kuwait or Saudi Arabia that had the capability to defend the Persian Gulf ports from attack of any kind. The entire CB defense planning process is predicated on having a forward-deployed U.S. military force in place, Korea for example, defending the port and sustaining command, control, and combat support prior to enemy CB attack. When there is no forward-deployed force, early enemy use of CB weapons can have an enormous impact on all operations to include dramatic effects on U.S. strategy.[49] Doctrine does not address how, at the outset of a crisis, port CB defense is accomplished in a mature theater without U.S. military forces. Certainly, the host and neighboring nations will bear this responsibility.

United States forces entering Somalia in 1993 did so largely over bare beaches initially until inland ports were secured for follow-on forces. Somalia is an example of an arid, austere environment that presents logistics challenges to CB defense, particularly the mission of decontamination. The main consideration in either an austere or arid coastal environment is water to support decontamination. While seawater may be plentiful, it is not suitable for aircraft and sensitive equipment decontamination and it will

eventually render decontamination equipment unserviceable. The lack of desalinated water results in a need for a water purification capability to support decontamination operations.

"Whether war, or military operations other than war, theater conditions and threat drive NBC defense planning."[50] That statement suggests that the range of military operations is immaterial in the shaping of port CB defense and consequence management actions. Military operations, whether they are strikes and raids, peace enforcement, or support to insurgencies are linked to specific threat courses of action through operation-specific JIPB.[51] For example, a military strike or raid, launched from Incirlik Air Base in Turkey against Iraqi air defense sites in northern Iraq could inspire a retaliatory terrorist or insurgent CB attack on that airport. Additional or alternate targets may include Kuwaiti or Saudi Arabian ports supporting U.S. presence in the region for which there may be little prepositioned or forward deployed CB defense capability.[52]

Peace enforcement missions, such as U.S. and coalition presence in the former Yugoslavia, involve the offensive capability of belligerent groups and their desire to thwart coalition goals of conflict cessation.[53] Port CB defense is challenging when there has been no forward presence established in the region and the infrastructure is severely damaged from earlier conflict. Support for insurgencies are usually covert operations but can involve conventional forces when situations either require particular specialties or grow in such scope as to require conventional forces.[54] In these operations, typically lacking robust U.S. military involvement, threat forces target known U.S. elements, key facilities, government installations, and logistics hubs, such as ports.[55] Amidst complex

political unrest, defending those ports against CB attack in absence of U.S. chemical defense units can be precarious.

The most serious shortfalls in the port CB defense and consequence management plans are found in applicability to joint, multinational and host nation forces and operations. The evaluation that follows discusses shortfalls in three categories: (1) U.S. military common shortfalls, (2) Navy and Air Force shortfalls, and (3) host nation and multinational shortfalls. The common shortfalls include training deficiencies, inadequate medical prophylaxis, and lack of integration of supplemental unit capabilities. The Navy and Air Force shortfalls concern warning, redirection, and decontamination challenges related to strategic lift assets, cargo, merchant and harbor vessels, Civil Reserve Air Fleet (CRAF), Army Prepositioned Afloat (APA) assets. The last area, host nation and multinational shortfalls, include both personnel and port facility protection, defense, and consequence management challenges.

Today's CB defense training is battlefield-oriented, leaving forces unprepared and untrained to counter asymmetrical CB threats such as attacks against ports during force projection operations.[56] The focus of CB defense has been, and for the most part continues to be, on massive battlefield use despite the probability that this threat scenario is no longer the most likely enemy course of action.[57] Cited earlier, table 2, Fixed-Site NBC Defense Task List, contains the tasks that overlay battlefield CB defense missions on port operations. Neither home station training facilities nor any of the combat training centers provide opportunities or resources to adapt the CB defense and consequence management process to port environments. The variety of potential CB agents, particularly the biological pathogens and toxins, that can be produced by adversary

nations, pose serious threats to concentrations of soldiers at ports because medical prophylaxis treatments exist only for anthrax[58] and nerve agent.[59] This limited pre-treatment capability can create increased strain on medical and logistics systems not likely to be in place during force projection operations. The last common shortfall is the lack of doctrinal guidance for the use of supplemental units in CB defense. Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports, and Airfields*, provides a quick overview of capabilities but no procedure for the integration of Army combat engineers, supply and transportation units, technical escort, explosive ordnance demolition, Naval Construction, Marine Corps Chemical/Biological Incident Response Forces (CBIRF), or Air Force Prime Base Engineer Emergency Force (PRIME BEEF) and Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer (RED HORSE) units.[60] Descriptions of these units are in table 3.[61]

Successful force projection relies on strategic lift assets remaining operationally ready and able to enter the ports of debarkation. In the event of CB attacks on ports during force projection operations, procedures for the warning and potential redirection of both ocean-going naval and merchant vessels and Air Force and CRAF aircraft do not exist. Decontamination techniques designed for tactical battlefield scenarios are not adaptable to requirements for ships, harbor vessels, aircraft, and cargo. There are no certification procedures or criteria established for operational resumption of strategic lift assets from within a CB attack or hazard area. The same shortfalls exist for equipment located in APA sets at Maritime Prepositioned Ship (MPS) anchorages.

Host nation assets; including port facilities, civilian personnel, and military forces; are extremely vulnerable to enemy CB attack. This is due to the lack of CB

Table 3. Force Augmentation to CB Defense

Source	Unit Type	Equipment	Capability
Army	Combat Engineer	Earth Moving, Dump Trucks, Road Graders, Excavators, Cranes, Trucks, 125/600 GPM Pumps	Terrain Decontamination Assistance (Preparing, Covering, Clearing the Decontamination Site)
	Quartermaster (Supply)	Water Purification and Storage, Trucks, Large Water Haul Capacity	Terrain Decontamination Assistance (Water Storage and Delivery), Water Hauling and Pumping Capability
	Technical Escort	TAP Suits, M18A2 Chemical Agent Detection Kits	Emergency Neutralization and Disposal of Chemical Agents, Escorts Hazardous Material
	Preventive Medicine Staffs & Detachments	M272 Water Test Kits, Preventive Medicine Water Quality Control Set, Preventive Medicine Industrial Hygiene Surveillance Equipment	Contamination Surveillance for Supplies and Water Sources, Recommendations on Providing Drinking Water Under NBC Conditions
	Area Medical Labs	NBC Agent Identification Equipment, Surveillance and Analysis Equipment for Endemic/Epidemic Disease	Provide In-theater Initial Identification of NBC Agents
	Veterinary Services	Food Quality Assurance Medical Testing Set	NBC Contamination Surveillance, Food Surveillance, Quality Assurance
	Aviation	OH-58 A/C/D UH-60 CH-47	Aerial NBC Reconnaissance and Surveillance Platforms
	Explosive Ordnance Demolition	TAP Suits, M18A2 Chemical Agent Detection Kits	Detect, Identify, Render Safe, Evacuate, and Dispose of Conventional and Improvised CB weapons
Air Force	Prime Beef	Power Generation, Civil Engineer Control Sets, Pest Management Sets, Fire Fighting Clothing Sets	Protect Base Resources From Conventional and NBC Attack, Constructs Covers and Sheds, Decontamination, Rapid Runway Repair
	RED HORSE	15 Ton Crane, Scoop Loader, 2.5 CU YD Loader, Excavator, Rock Drill Crawler, Well Drilling Machine, Mixers, Dozers, Heavy Trucks, Rollers, Sweepers	Large-Scale Terrain Decontamination Support, Establish and Modify Decontamination Sites and Facilities to Support Decontamination (Wash Racks, Rail Yards)
Navy	Naval Construction Force Support Unit (NCFSU)	Dump Truck, 60 Ton Crane, Scraper, Rock Crusher, Wheeled Loader, Dozer, Semi-Trailer, Paver, Roller	Large-Scale Terrain Decontamination Support, Establish and Modify Decontamination Sites and Facilities to Support Decontamination (Wash Racks, Rail Yards)
	Naval Mobile Construction Battalion (NMCB)	15 Ton Dump Truck, Loaders, Dozers, Graders, Scrapers, M12 Decontamination Set, 14 & 35 Ton Cranes, Excavator, Forklift	Large-scale Terrain Decontamination Support, Establish and Modify Decontamination Sites and Facilities to Support Decontamination (Wash Racks, Rail Yards)
Marines	Chemical/Biological Incident Response Force (CBIRF)	Specialized Shower System, M21 Remote Sensing Chemical Agent Alarm, M93A1 FOX Reconnaissance System, Reverse Osmosis Water Purification Unit	Up to 5 KM Standoff Detection of Nerve and Blister Agent, Detect, Identify, Mark Contamination, Produce Potable Water (600 GPH – Seawater, 1,800 GPH – Fresh Water), Will Remove NBC Contaminants

defense and consequence management procedures for strategic ports both with and without U.S. military forward presence. Theater ballistic missile and theater air defense procedures for port defense do not define coverage parameters or integration with port defense command and control. Critical port mission functions are not addressed in NBC defense doctrine for decontamination, detection, reconnaissance, or smoke generation missions. Unconventional air-, ground-, and sea-based CB warfare threats are not mitigated in physical security requirements or plans. Terrorists who successfully infiltrate port operations will seek to employ covert CB weapons against high payoff targets. These potential targets have not been identified as priority passive detection requirements despite the probability that the only recognition of CB attack will be sudden and massive personnel casualties.

Responding to conventional and CB casualties in a CB environment requires a robust collective protection medical system. Procedures for determining the required density of medical, decontamination, detection, and reconnaissance units in a port of debarkation are non-existent in NBC defense doctrine. Collective protection facilities and consequence management capabilities must be established before a CB attack occurs yet there is no guidance on priorities, decontamination site construction, contaminated waste runoff and disposal, or traffic control plans within the context of port operations.

The continued successful operation of these ports is dependent upon the survivability of the civilian and military personnel of both the host nation and foreign countries. Both Joint Publication 3-11, *Joint Doctrine For Nuclear, Biological, and Chemical Defense Operations*, and Army Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports and Airfields*, recognize the vulnerability of these

groups and correctly identify that they need to be trained and protected. The methods for accomplishing these tasks, either deliberately or in a crisis, have not been developed. This situation can have dire impacts for U.S. national and military strategy in a region with little or no U.S. forward deployed forces.

In a crisis, responsibility for overcoming a shortfall rests with the leaders and units facing the shortfall. The CINC and JFC staffs are responsible for broad task of theater NBC defense planning. Defending against and responding to enemy CB attack in an APOD or SPOD during force projection operations has not been defined by doctrine as a mission in terms of task, condition, standard, leader tasks, and critical tasks. By failing to define port CB defense in those terms, responsibility can not be properly established at either the strategic, operational or tactical levels of war or military operations. The shortfalls described in the planning and execution of port CB defense and consequence management illustrate the lack of defined lines of responsibility.

Port CB defense and consequence management planning consist of lengthy and complex considerations, summarized earlier in figure 26, which leave significant shortfalls in the U.S. military's ability to defend against and recover from enemy CB attack in strategic ports of debarkation during force projection operations. Doctrine omits discussion of active defensive measures against a range of threats possessing missile or air delivered CB weapon systems. United States Army air defense units are the primary source of interdiction of these threats and by omitting detailed discussion, a critical command, control, and coordination link, integral to a synchronized defense plan, is lost.

Physical security measures to counter terrorist or unconventional warfare-delivered CB weapons are weak. Doctrine makes a dangerous assumption that the operational environment is defined with forward-deployed U.S. military presence in theater ready to respond to these threats and the havoc they can potentially wreak. This assumption eliminates any discussion of how ports are protected in regions absent of U.S. military presence. The range of military operations, as a factor in shaping CB defense, is discounted in favor of a strict adherence to threat analysis and the operational environment. The process for IPB establishes that U.S. military operation-type influences threat course of action.[62]

The most serious shortfalls in CB defense and consequence management planning and execution fall within joint and multinational operations. Shortfalls common to all the services include training challenges, medical prophylaxis limitations, and complementary unit integration to port CB defense missions. Warning, redirection, and decontamination procedures pose difficult problems for U.S. Navy and Air Force strategic lift assets. The protection and decontamination of critical port mission functions plus the survivability of host nation and multinational military and civilian personnel are critical to the maintenance of port operations. Port CB defense and consequence management is not defined as a mission with specific tasks, conditions, and standards and, as a result, responsibility to accomplish these many tasks are not adequately defined.

Chapter Summary

Several key doctrinal publications provided the information base for the substance of chapter 4. Before the analysis could begin, the linkage between the four components

of the CB Defense Model and the five evaluation criteria was established. The literature review in chapter 2 on the components of the thesis question (operational environment, force projection, port operations, threat evaluation, and planning, protection and response to CB attack) serve to establish credibility references for the evaluation criteria. Chapter 5 pursues recommendations to shortfalls within the four components of the CB Defense Model: (1) Threat Analysis, (2) Vulnerability Assessment, (3) Vulnerability Mitigation, and (4) Consequence Management Planning and Execution.

The threat analysis process, NBC JIPB, lacks details on terrorist and unconventional CB potentials. There is no method for assessing the impact of the operational environment on enemy CB courses of action. The NBC JIPB is largely focused on MTW and offers no special considerations for operations other than war (OOTW). Vulnerability assessment is a process that does not exist for port environments. Current doctrine is replete with useful and adaptable considerations for determining what the vulnerable assets may be, but there is no CB weapon effects analysis process for port critical mission functions. The many mitigation techniques prescribed by doctrine are MTW-focused with little adaptability to OOTW and unconventional warfare threats. The only link to joint applicability is the recognition of the need for TBMD and theater air defense. The most dangerous assumption is that the operational environment is defined with full U.S. military presence. Lastly, CB defense planning and consequence management execution outline what are perhaps the most profound shortfalls in U.S. doctrine. There is no standard for determining consequence management asset requirements for a port. There are no JTTPs for the base cluster or base commander on how to plan, organize and execute port CB defense and consequence

management. NBC doctrine discusses this mission only under the terms of an existing forward U.S. military presence and omits discussion of active defense requirements. Port CB defense and consequence management planning consist of lengthy and complex considerations, yet leave significant shortfalls in each component of the CB defense model. Chapter 5 will systematically address recommendations to these shortfalls and end with a proposed comprehensive planning framework for CB defense of strategic ports.

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[1]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations - Draft* (Washington, DC: Department of Defense, March 1998), I-2.

[2]Ibid., I-3.

[3]Ibid., I-4.

[4]Ibid., I-5.

[5]California Polytechnic University, *Tokyo Subway Gas Attack, Chemical and Biological Terrorism* (Calpoly University Home Page, June 1996, on-line, accessed 24 Oct 1998); available from http//www.calpoly.edu/~drjones; Internet.

[6]Ibid.

[7]Department of the Army, Field Manual 100-7, *Decisive Force: The Army in Theater Operations* (Washington, DC: U.S. Government Printing Office, 1995), 2-29.

[8]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 7-8.

[9]Department of the Army, Field Manual 34-130, *Intelligence Preparation of the Battlefield* (Washington, DC: U.S. Government Printing Office, 1994), 6-12.

[10]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 13-7.

[11]Department of the Army, Field Manual 34-130, *Intelligence Preparation of the Battlefield* (Washington, DC: U.S. Government Printing Office, 1994), 6-16.

[12]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 13-8.

[13]Department of the Army, Field Manual 34-130, *Intelligence Preparation of the Battlefield* (Washington, DC: U.S. Government Printing Office, 1994), 6-17.

[14]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations - Draft* (Washington, DC: Department of Defense, March 1998), I-1.

[15]Ibid., I-3/4.

[16]Ibid., D-7.

[17]Ibid., G-6/7.

[18]Ibid., G-7.

[19]Ibid., III-1.

[20]Ibid., I-9, I-10.

[21]Ibid., I-9.

[22]Department of the Army, Field Manual 3-4-1, *Multiservice Procedures for NBC Defense of Fixed-sites, Ports, and Airfields* (Washington, DC: U.S. Government Printing Office, 1998), F-7 (hereafter cited as Army FM 3-4-1).

[23]Office of the Secretary of Defense, "Assessment of the Impact of Chemical and Biological Weapons on Joint Operations in 2010," Summary Report (McLean, Virginia: Booz•Allen & Hamilton, Inc., 1997) 17.

[24]Army FM 3-4-1, B-28.

[25]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations - Draft* (Washington, DC: Department of Defense, March 1998), VI-5.

[26]Army FM 3-4-1, Ch. 3.

[27]Ibid., 3-1.

[28]Ibid.

[29]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations - Draft* (Washington, DC: Department of Defense, March 1998), K-1.

[30]Army FM 3-4-1, A-2.

[31]Ibid., B-1.

[32]Ibid., 3-13.

[33]Ibid., 3-7.

[34]Ibid., 3-14.

[35]Ibid., D-10.

[36]Ibid.

[37]Ibid.

[38]Ibid., D-11.

[39]Ibid.

[40]Ibid., D-12.

[41]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations - Draft* (Washington, DC: Department of Defense, March 1998), G-7.

[42]Department of the Army, Field Manual 3-5, *NBC Decontamination* (Washington, DC: U.S. Government Printing Office, 1993), 5-0.

[43]Army FM 3-4-1, H-1.

[44]Ibid., A-2.

[45]Ibid., 2-6.

[46]Department of the Army, Field Manual 44-85, *Patriot Battalion and Battery Operations* (Washington, DC: U.S. Government Printing Office, 1997), 5-7.

[47]Department of the Army, Field Manual 55-60, *Army Terminal Operations* (Washington, DC: U.S. Government Printing Office, 1996), 3-6.

[48]Ibid.

[49]Department of the Army, Field Manual 100-5, *Operations* (Washington, DC: U.S. Government Printing Office, 1993), 6-10.

[50]Army FM 3-4-1, 3-3.

[51]Department of the Army, Field Manual 34-130, *Intelligence Preparation of the Battlefield* (Washington, DC: U.S. Government Printing Office, 1994), 6-1.

[52]Ibid., 6-12.

[53]Ibid., 6-16.

[54]Ibid.

[55]Ibid., 6-18.

[56]The Joint Staff, J8, "Assessment of the Impact of Chemical and Biological Weapons on Joint Operations in 2010, The CB 2010 Study," Summary Report (McLean, Virginia: Booz•Allen & Hamilton, Inc., 1997) 32.

[57]Ibid., 25.

[58]Ibid., 32.

[59]Army DM 3-4-1, B-1.

[60]Ibid.

[61]Office of the Joint Staff, Joint Pub 3-11, *Joint Doctrine for Nuclear, Biological and Chemical Defense Operations - Draft* (Washington, DC: Department of Defense, March 1998), J-14.

[62]Department of the Army, Field Manual 34-130, *Intelligence Preparation of the Battlefield* (Washington, DC: U.S. Government Printing Office, 1994), 6-1.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Threat analysis, vulnerability assessment, vulnerability mitigation, and consequence management planning and execution are the Chemical and Biological (CB) Defense Model components evaluated in chapter 4. The evaluation identified shortfalls that provide the foundation for drawing fact-based conclusions regarding the adequacy of U.S. CB defense and consequence management procedures at strategic airports and seaports of debarkation (APOD/SPOD) during the vulnerable period of force projection operations. The conclusions drawn from the evaluation are described in depth with regard to the effect the shortfalls have on both the planning and execution of APOD and SPOD CB defense and serve as the basis for the corrective recommendations that follow.

While the research and recommendations contained in this thesis serve to address CB defense of strategic overseas ports of debarkation (POD), several related topics with similar dilemmas are commended to the professional military scholars for further research. Those related topics include CB defense of continental U.S. (CONUS) ports of embarkation (POE); joint CB vulnerability analysis; CB defense of Military Prepositioned Ship (MPS) anchorages; nuclear, biological, and chemical (NBC) defense of joint and multinational functional combat service support (CSS) facilities; and the strategic, operational, and tactical capabilities of the military's NBC defense force structure. The chapter concludes with a comprehensive summary that revisits the need for the study and discusses how the thesis question provided the initial framework for the

methodology, the appropriate literature and research sources, and finally, the method of evaluation to support conclusions and recommendations.

Threat Analysis Conclusions

Threat analysis in general, and NBC joint intelligence preparation of the battlefield (JIPB) in particular, fails to adequately identify potential threat targets and methods of attack thereby leaving friendly force vulnerabilities undefined and open to unmitigated CB threat attack. Threat analysis and NBC JIPB focus on the peer opponent threat in the major theater war (MTW) but fail to both analyze unconventional, insurgent, or terrorist CB threat potential, or recognize any impact of environmental maturity or military operation-type on the probable CB threat course of action (COA).

Threat Analysis Recommendations

The NBC JIPB and the CB risk assessment models discussed in chapter 2 serve as a preliminary start point from which recommended modifications can be implemented. Threat organizations, whether they are peer opponents, insurgents, terrorists, or a combination of many, must be defined to include analysis of their organizational objectives, pursuits, and methods of operation. Each threat element, to include any organic subsets, must be evaluated in terms of generic CB weapon capability and CB weapon employment fundamentals.

For example, it must be determined if a peer opponent employs both conventional and unconventional forces; insurgent, political, and radical religious elements; and finally, terrorist organizations. The subordinate elements that comprise the complete

capability of the peer opponent must be analyzed individually with regard to the CB weapon capabilities they possess and what their employment fundamentals consist of. Conventional forces likely possess CB-weaponized missiles, artillery, bombs, and rockets. Unconventional forces may possess CB-weaponized bombs, mines, or boobytraps. The other factions, whether they be insurgents or terrorist organizations, may possess the capability to manufacture their own CB agents and deliver them through the use of nonstandard delivery systems, such as articulated in the *CB 2010 Study*. Employment fundamentals fall in the realm of doctrine. Given the capabilities of each element within the peer opponent, the questions to be answered are, What are the typical targets? When will the weapons be used against those targets? What effect is the threat element trying to achieve on those targets? and How will he exploit the use of those weapons?

These defining factors must be superimposed over environmental conditions and military operation types to determine as many potential enemy courses of action, potential targets, and friendly vulnerabilities as possible. Figure 28, Environmental CB Threat Analysis, illustrates the overarching concept while figure 29, Detailed CB Threat Analysis, takes a closer look at the process using one threat organization as an example. The incorporation of environmental impacts to the threat analysis process is nothing new. In fact, the operational environment assessment models discussed in chapter 2 emphasize the importance of including these factors into the threat analysis process. The problem is that the NBC JIPB, as depicted in Joint and NBC doctrine, stops far short of any inclusion of these concepts. Therefore, figure 28 starts where doctrine leaves off and that is with the NBC JIPB and CB risk assessments.

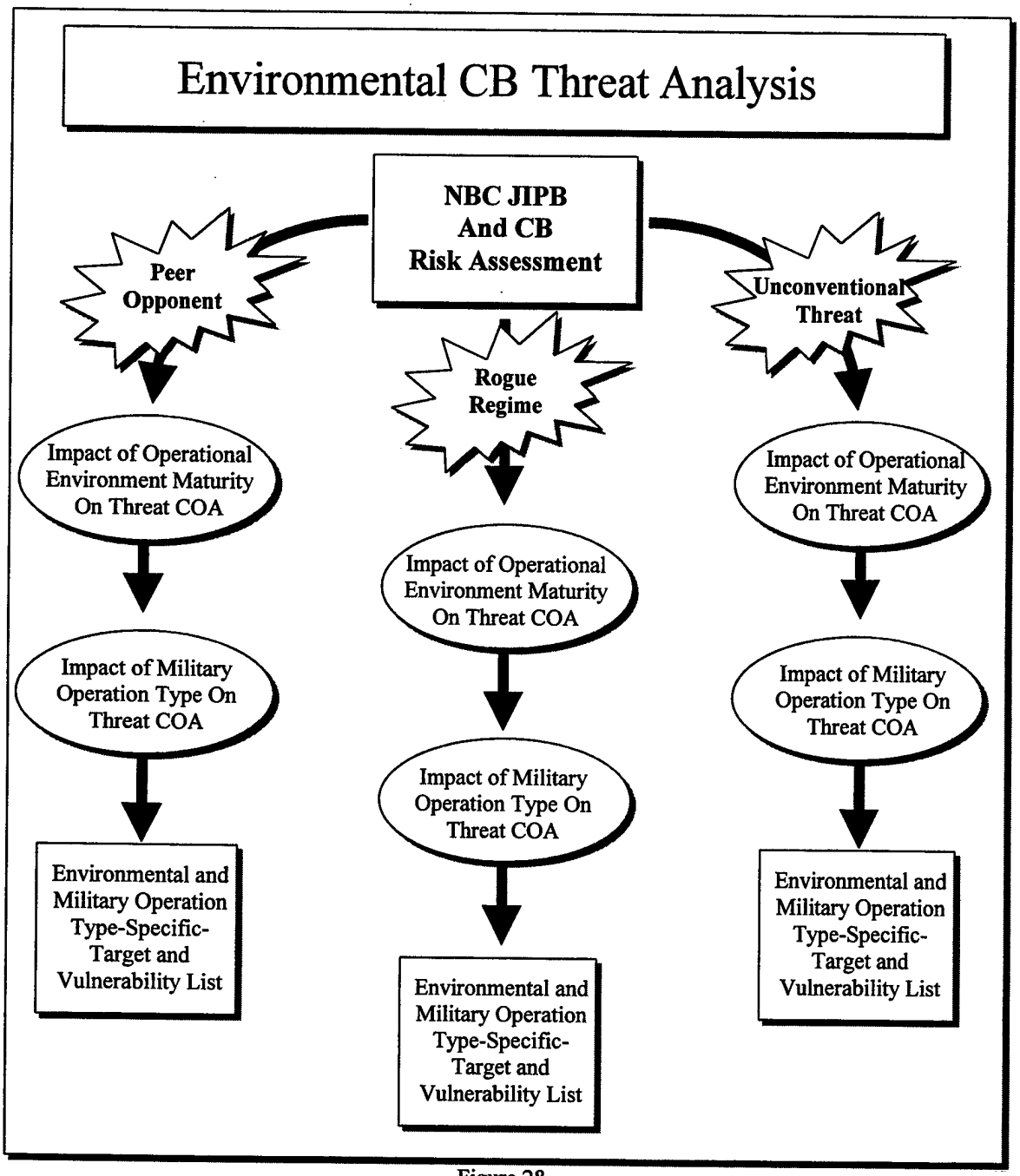
Environmental CB Threat Analysis
NBC JIPB And CB Risk Assessment
Peer Opponent
Rogue Regime
Unconventional Threat
Impact of Operational Environment Maturity On Threat COA
Impact of Military Operation Type On Threat COA
Environmental and Military Operation Type-Specific-Target and Vulnerability List
Impact of Operational Environment Maturity On Threat COA
Impact of Military Operation Type On Threat COA
Environmental and Military Operation Type-Specific-Target and Vulnerability List
Impact of Operational Environment Maturity On Threat COA
Impact of Military Operation Type On Threat COA
Environmental and Military Operation Type-Specific-Target and Vulnerability List

Figure 28.

The environmental CB threat analysis attempts to ensure that the process of "threat analysis" includes considerations for a complete range of threats, a variety of operational environment maturity levels, a linkage to the type of planned military operation, and a focused, logically derived target or vulnerability list. Labeling the threat organization as a peer opponent, rogue regime, or some type of unconventional force provides the CINC staff planner with a systematic approach for analyzing capabilities, influences, and intents unique to that threat organization and its potential subelements. The maturity level of the operational environment can directly influence the threat course of action in terms of targeting and perceived vulnerabilities of the opposition. Since Army intelligence doctrine does not discount the impact of the military operation on the threat course of action, NBC JIPB must not discount it either. For this study, the military operations considered in the literature evaluation focused on major theater war (MTW), military strikes and raids (MS&R), peace enforcement and peace keeping operations (PE/PKO), and support to insurgencies (SPT INS). Like the operational environment, the type of military operation being conducted can be a primary factor for shaping threat actions against U.S. forces and interests. The end state for this process is an enemy CB weapon employment scenario complete with specific targets tailored to force organization, precise environmental conditions, and the military operation.

Figure 29, The Detailed CB Threat Analysis, looks at this same process at much greater resolution using the peer opponent as an example threat force. Doctrinal NBC JIPB has identified primarily the conventional threat CB weapon capabilities likely to be employed on the tactical battlefield. The process that follows is designed to meet the endstate described above. Labeling the threat organization, in this case peer opponent,

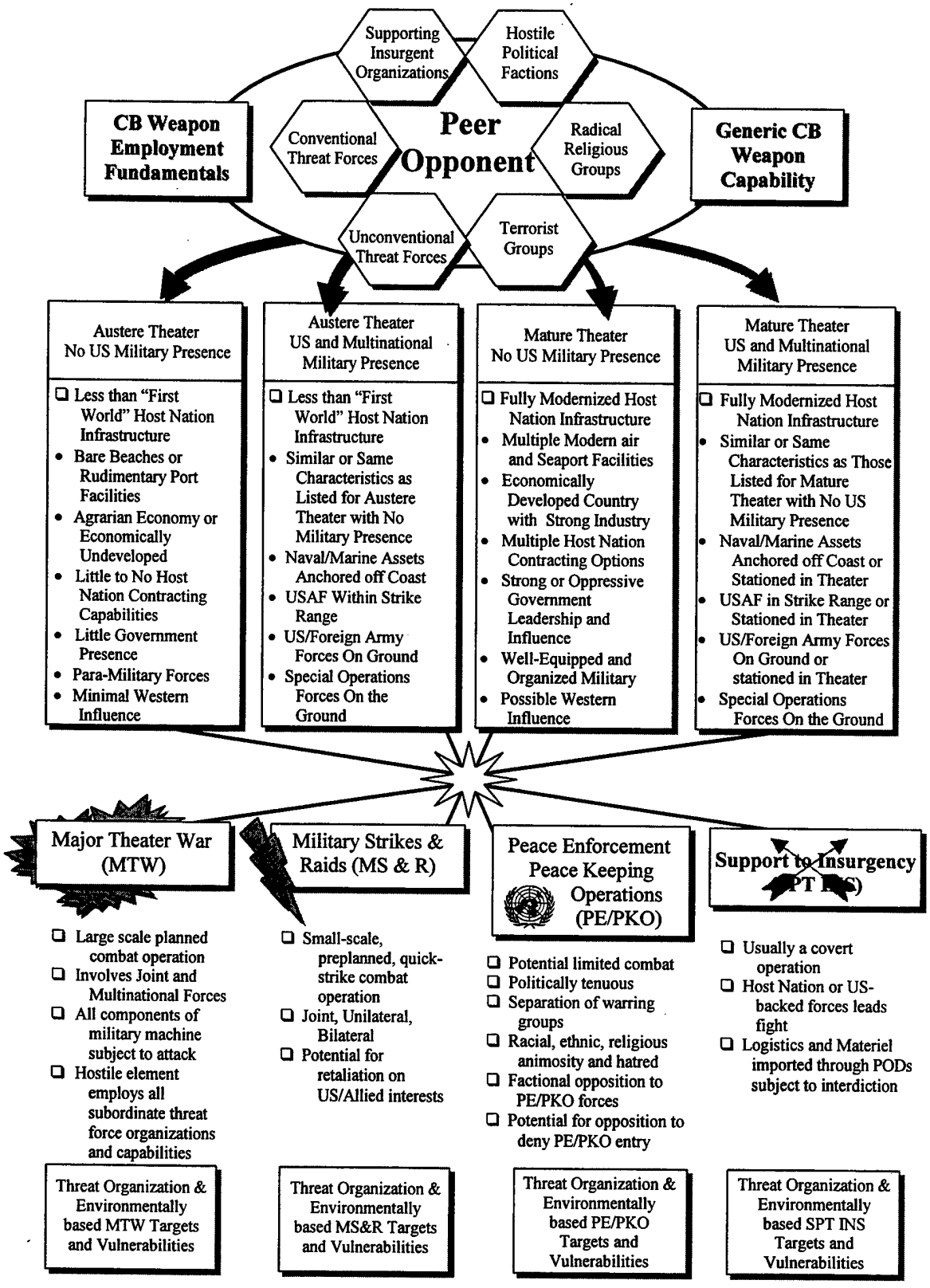

Figure 29. Detailed CB Threat Analysis

with all possible subordinate forces keeps the planner aware of the multitude threat force possibilities that must be analyzed through this process. For example, the CINC staff planner embarks on this process armed with the knowledge of the peer opponent and subordinate organization's CB weapon capabilities. Starting with the conventional force (e.g., the enemy army) and its CB weapon capabilities, the planner determines the characteristics of the operational environment, with a keen awareness of the ports, and proceeds to generate the impacts of those characteristics on the enemy CB COA.

The four operational environments depicted in figure 29 illustrate "austere" and "mature" environmental extremes but purposefully omit the range of possibilities that fall in between. The point of the portrayal here is to show planners that there is a range of environmental conditions unique to theater maturity. The examples shown in figure 29 illustrate conditions generally consistent with the environmental extremes. Those conditions are intended to help planners draw conclusions about threat intent, objectives, and targets. The peer opponent example, with mature theater and a forward U.S. military presence, assumes that diplomacy (e.g., threat of overwhelming retaliation) has effectively deterred the hostile nation from any overt CB strike on the APODs and SPODs. This circumstance may increase the likelihood that the peer opponent will attempt a deniable CB attack on any of the critical mission function areas of the air or seaports through the use of radical subgroups or terrorist organizations. Defining the environment in this manner will help reveal potential enemy CB COA considerations and identify friendly COA limitations and vulnerabilities.

Once the threat organization has been analyzed against the influences of the theater environment, the process then moves to examine the impact of the type of military

operation on threat CB COAs with regard to the environmental and organizational-specific target potentials. This thesis cited MTW, MS&R, PE/PKO, and SPT INS to represent a range of U.S. military operations. Arguably, U.S. and allied military actions taken against a hostile nation have a great deal to do with the shaping of enemy response. Generally speaking, the greater the provocation, the more hostile the response.

In figure 29, MTW places virtually every element of the U.S. and allied military machine at risk for overt attack. The U.S. desires to attain air and naval superiority early by neutralizing or destroying enemy strategic capabilities, to include the enemy's weapons of mass destruction (WMD) capability. As a result, the enemy, in the context of an MTW, may try to use that capability before it is destroyed. The other three military operations shape enemy response in less predictable terms. The U.S. military strikes against Libya in 1986 and Afghanistan, Sudan, and Iraq in 1998 all spawned public threats of retaliation against the U.S. This type of military operation and the potential for retaliation requires planners to consider, in advance, the vulnerability of all U.S. and allied interests not only within the region but wherever the threat can range.

Similar considerations apply as well to PE/PKO and SPT INS. Figure 29 notes that in these operations, the tenuous political situations require restrictive rules of engagement to avoid provocation of or confrontation with belligerent factions that oppose U.S. and foreign military efforts to enforce fragile cease fires. In each of these operations, the level of opposition must be thoroughly analyzed to determine the degree of risk associated with the insertion of military forces. The detailed CB threat analysis process concludes with the creation of a target and vulnerability list tailored to each threat organization operating in an environment of defined maturity during the conduct of a

specific military operation. This process provides planners with the raw target and vulnerability data necessary to proceed into the next phase, vulnerability assessment.

Vulnerability Assessment Conclusions

This is a system currently weakened by an inadequate threat analysis procedure. There is no process for a quantitative CB threat effect-analysis on strategic APODs or SPODs either before or during force projection operations. The vulnerability assessment process developed for units in a tactical battlefield environment facing a peer opponent threat is inaccurate, inconsistent, and incomplete when applied to a port environment. This shortfall is significant because it leaves planners without a credible baseline process for determining adequate mitigation needs for critical port mission functions in environments exposed to a wide range of threats.

Vulnerability Assessment Recommendations

For this to be a fruitful process, threat analysis must produce a comprehensive threat CB target list to including vulnerabilities occurring from collateral CB weapon effects. Quantitative effect analysis must measure the enemy's desired CB weapon effect based upon friendly interpretation of his known or perceived capability prior to the implementation of friendly mitigation measures. Given the supposition that most APODs and SPODs will be located out of enemy artillery range, the most probable CB delivery systems will likely be missiles, bombs, mines, and unconventional warfare devices. Additionally, there needs to be a process that classifies the critical port mission functions as targets and vulnerabilities and includes formulas that estimate the number of

sorties or CB devices that must be employed to achieve a specific effect. Constructing a vulnerability assessment process for the port environment is a research project in itself. Tables 4 and 5, SPOD and APOD Chemical Vulnerability Assessment, outline what such a process should achieve for both SPODs and APODs. The most critical portions of tables 4 and 5 are the columns for first, second and third order effects. Battlefield vulnerability assessment offers mathematical formulas for determining the first order casualty effects in a tactical environment but it is doubtful that those procedures would equally apply to a port environment characterized by extremely high population densities and some natural mitigation in the form of the overhead cover offered by buildings. Moreover, it is the effects beyond the obvious casualties, the identification and definition of second and third order effects, that present a greater challenge for defense planners if U.S. strategic aims are to be achieved. While both figures represent rather basic examples, they do serve to illustrate how enemy CB capabilities overlaid onto critical port mission functions at critical times enable planners to identify first, second, and third order effects of CB attacks.

The second and third order effects depicted in the figures are rather superficial because they only serve to illustrate how the end state of vulnerability assessment is achieved. Planners must wargame each critical port mission function against enemy CB attacks occurring at various times during the force projection process. Once the obvious first order effects have been identified, planners must then assess the impact of the attack on the entire reception, staging, onward movement, and integration (RSOI) process. Figure 30 offers suggestions on what the potential impacts on RSOI may be.

Table 4. Chemical and Biological Vulnerability Assessment - SPOD					
Critical Port Mission Functions	Agent & Delivery System	Vulnerability Windows	Natural Mitigation	1st Order Effects	2d/3d Order Effects
Berths, Docks, Transfer Yards	Missile Bomb UCW Devices GB VX, HD, Air spray of BIO agents	Pre-Force Projection, Peak operation times, windows of limited response, Dawn, Dusk	Buildings	Contamination of waterfront opns, shipping vessels, MHE, personnel, cargo; personnel BIO and chemical casualties.	Disruption/halt of sealift opns, U.S. military strategy in jeopardy; Hazard extends across SPOD, Manpower and medical assets overwhelmed.
Transport & Harbor Operations Vessels			Vessels		
Operations Areas	UCW Devices, GB	Limited physical security, High optempo	Buildings	Personnel casualties, facility contamination	Disruption or halt of SPOD operations, Loss of civilian labor support.
Ground Transport Routes	Bomb Missile UCW Devices, VX, HD TGD, GB.	Marshalling areas full, line hauls of combat vehicles	None	Route/vehicle contamination/ spread, isolation, lasting vapor hazards	Rail/staging area bottleneck, RSOI disruption; CSS, civilian line haul disruption.
Unit Marshalling Areas		During periods of static, high unit density	Buildings	Personnel casualties, equipment & facility contamination, uncontrolled spread of contamination.	Units-combat ineffective, facilities/terrain unusable, trans./ life support assets overwhelmed, combat opns delayed.
Railheads		High volume of empty or full rail cars	None		

The missing link in these examples is the raw number casualty and equipment contamination estimates for which a reasonable process must be developed. Planners must be able to determine, for example, that one chemical missile landing in the center of the port of Dammam, Saudi Arabia, will produce 15 percent casualties for unprotected, exposed personnel under certain weather conditions. And likewise, a similar attack will

Table 5. Chemical and Biological Vulnerability Assessment - APOD					
Critical Port Mission Functions	Agent & Delivery System	Vulnerability Windows	Natural Mitigation	1st Order Effects	2d/3d Order Effects
Runways Taxiways Tarmac	Missile Bomb GB VX, HD, Air spray of BIO agents	Pre-Force Projection, Peak operation times, windows of limited response, Dawn, Dusk	None	Contamination of hard stands, aircraft, MHE, personnel, cargo; personnel BIO and chemical casualties.	Disruption/halt of airlift opns, U.S. military strategy in jeopardy; Hazard extends across APOD, Manpower and medical assets overwhelmed.
Ramp Areas			None		
Operations Areas	UCW Devices, GB	During limited physical security capability or high optempo periods	Buildings	Personnel casualties, facility contamination	Disruption or halt of APOD operations, Loss of contractor support.
Cargo Holding Areas			Buildings	Personnel casualties; MHE, cargo contamination	Aircraft bottleneck, RSOI disruption, CSS disruption.
Unit Marshalling Areas	Bomb Missile UCW Devices, VX, HD TGD, GB	During periods of static, high unit density	Buildings	Personnel casualties, equipment & facility contamination, uncontrolled spread of contamination.	Units are combat ineffective, facilities are unusable, transportation & life support assets overwhelmed, combat opns delayed.
Railheads		High volume of empty or full rail cars	None		

contaminate all equipment and facilities within a 500-meter radius of ground zero. These numbers will allow planners to establish appropriate levels of mitigation and consequence management. Without casualty and contaminated equipment numbers, planning becomes guesswork at best.

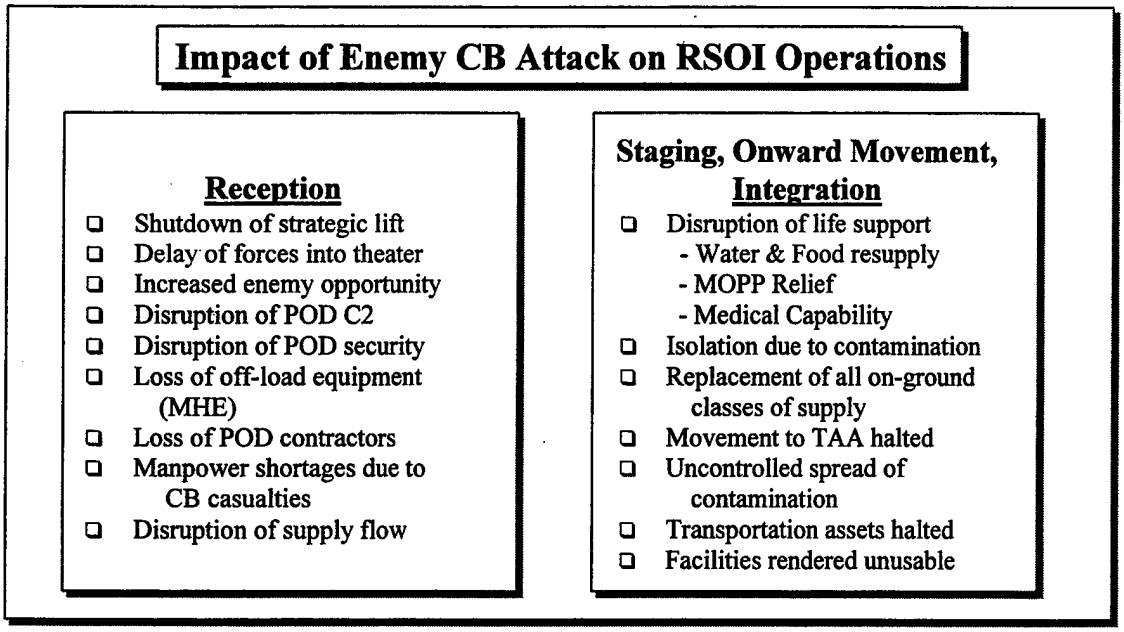

Figure 30.

Mitigation Conclusions

There is no mitigation plan for strategic ports prior to the arrival of U.S. military forces. Of the mitigation measures that can be applied to ports, numerous potential vulnerabilities remain unidentified due to weak threat analysis and vulnerability assessment procedures. This leaves the APOD and SPOD open to unmitigated CB attack. All mitigation efforts outlined by doctrine assume a forward-deployed U.S. military presence in a tactical battlefield environment with no service-unique considerations to satisfy joint mitigation requirements.

Mitigation Recommendations

The identification of adequate mitigation requirements depends upon the validity of the vulnerability assessment. The APOD and SPOD CB vulnerability assessments

described above identify baseline mitigation requirements for each potential target and vulnerability in terms of critical port mission functions. When there is a potential for multiple threat CB weapon strikes against targets of varying density, the mitigation and recovery plans must be constructed with appropriate depth to handle the magnitude of the crisis. Mitigation analysis at figure 31 illustrates the relationship between the target or vulnerability, the enemy strike potential, the density of assets requiring protection, and the mitigation or recovery need. The APOD and SPOD vulnerability assessment process seeks to identify all mitigation and post-attack recovery requirements for CB defense planners as they inventory host nation, U.S., and multinational capabilities.

Figure 31 depicts an APOD and SPOD base cluster with their subordinate bases which represent critical mission functions. These PODs and their critical mission functions represent a portion of the tailored target and vulnerability lists from the threat analysis process. Their vulnerability was assessed in tables 4 and 5. In the first two illustrations of figure 31, Phase I, Baseline Pre-Attack, the vulnerability is addressed with baseline passive and active mitigation measures needed to counter the baseline enemy CB capability. For example, basic recognition of enemy chemical weapon capability requires implementation of both active and passive mitigation to protect critical port mission functions from that threat.

In Phase II, Baseline Post-Attack, the vulnerability is addressed with baseline recovery requirements. Using the same example, if a chemical missile lands on one of the critical port mission functional areas, chemical decontamination is one of many capabilities needed to manage the aftermath. In Phase III, Tailored Mitigation and Recovery, the baseline mitigation and recovery needs are now tailored to the magnitude

POD Mitigation Analysis

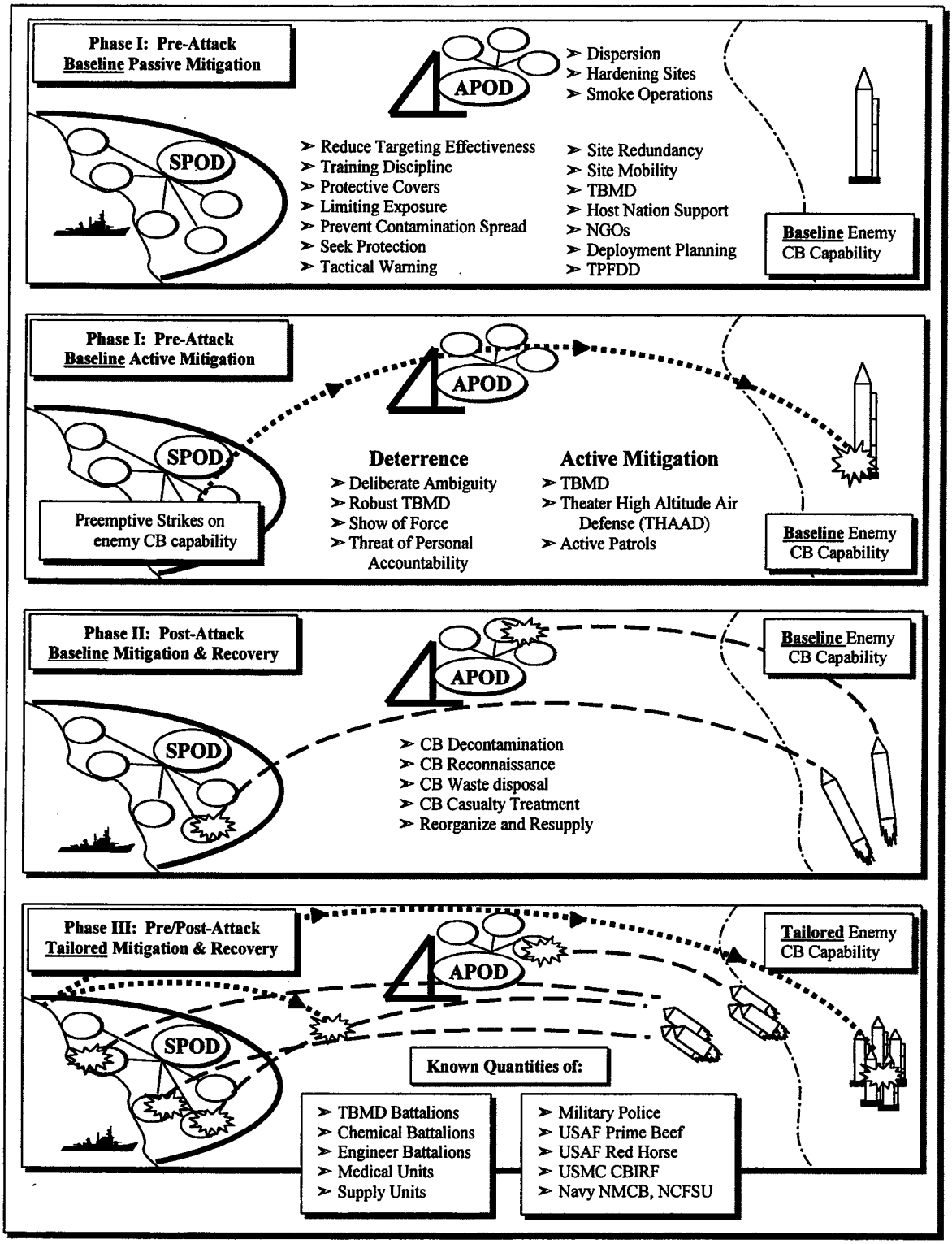

Figure 31.

of the threat and the scope of the PODs needing protection. It is in this phase that planners determine, based upon established planning factors and the enemy CB COA, the quantities of resources and units to support mitigation and recovery.

Before U.S. forces arrive in theater, the host nation is the primary agent for CB threat mitigation and post-attack recovery. With U.S. strategy resting on the preservation of the PODs, it is incumbent upon the U.S. to do everything to ensure the survival of the PODs. The U.S. embassy is the primary agent for U.S. planners as they seek to analyze and exploit host nation capabilities.[1] The embassy can provide information, links, and coordination concerning the capabilities of ports, governmental organizations, commercial enterprises, and nongovernmental organizations (NGOs) that may be operating in country.

Figure 32, Host Nation Mitigation and Post-Attack Recovery Options, provides a review of what the host nation may consider to, first, augment its own military capability, or, second, build a CB defense capability from civilian sources. Identifying and implementing host nation capabilities prior to U.S. deployments will allow U.S. planners to determine continuing CB defense shortfalls which will help shape U.S. force composition and time-phased force deployment data (TPFDD). The assumption is that the host nation possesses some ability to defend the APODs and SPODs but still requires augmentation from the U.S. military. As such, figure 32 does not identify the level or depth of CB threat mitigation or post-attack recovery but primarily seeks to identify sources of support for the construction of expedient host nation CB defenses.

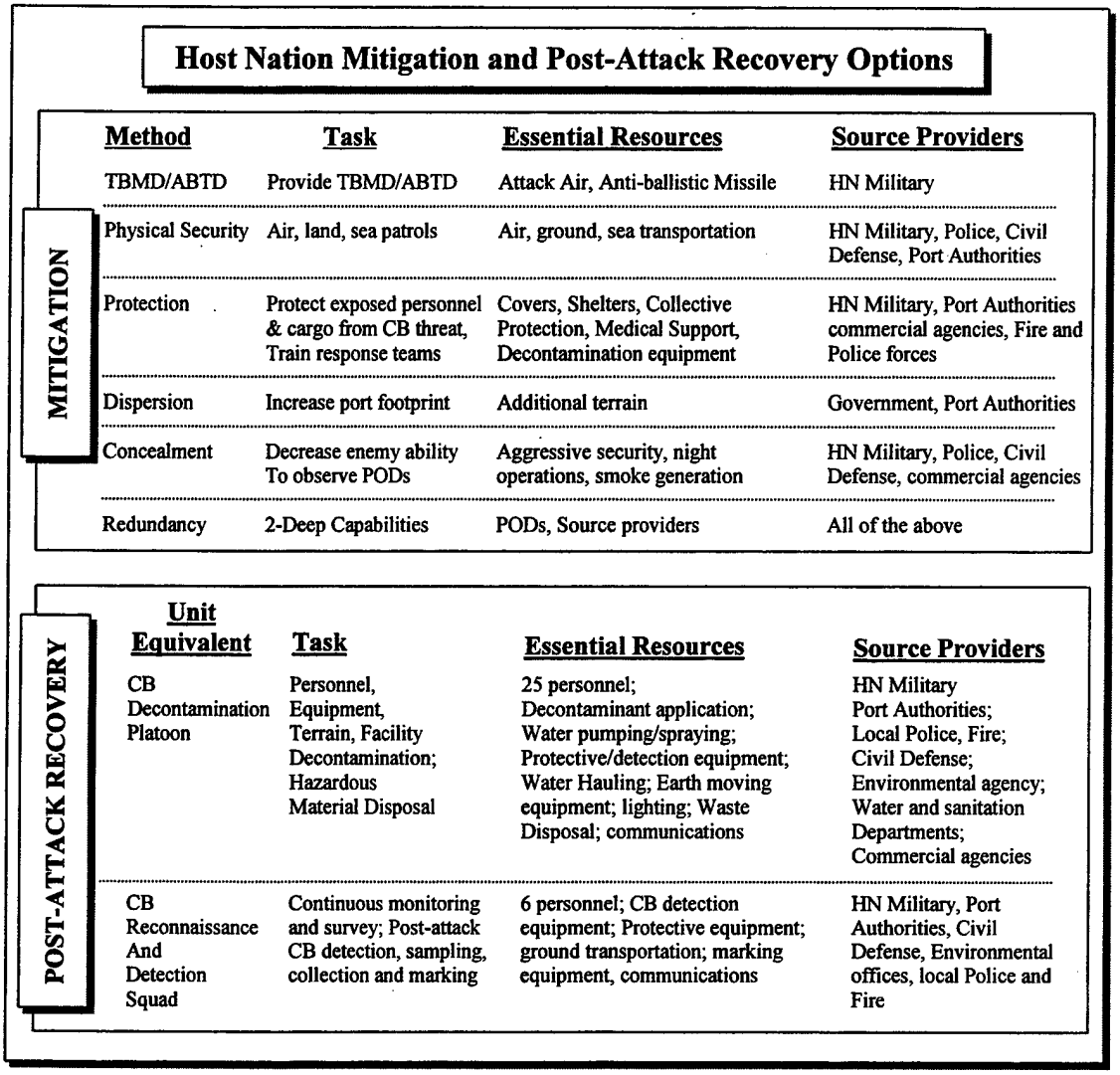

Figure 32.

Based upon the implementation of expedient APOD and SPOD CB defenses, the U.S. completes its deployment and TPFDD planning to meet the CB threat mitigation and post-attack recovery requirements identified from vulnerability analysis. Figure 33, POD CB Threat Mitigation and Post-Attack Recovery Planning, attempts to quantify the requirements for these missions from the perspective of the U.S. military. Unless a mitigation measure involves a military unit, it is difficult to quantify the requirements.

Theater ballistic missile defense (TBMD) and air breathing threat defense (ABTD) are missions that will invariably involve air defense units. At a minimum, one Patriot battery is required for asset protection of a POD provided the entire POD footprint is within twenty kilometers of the battery.[2] If threat forces possess a significantly robust TBM or ABT capability, planners may desire to increase the redundancy of all air defense capabilities.

The Joint Rear Area Coordinator (JRAC) will develop security and defense plans for the base clusters (APODs and SPODs) that must consider the potential for air-, sea-, and ground-based conventional and unconventional CB threats. The size of the APOD or SPOD footprint, the degree of dispersion, and the ability to reduce enemy observation are all factors that will determine how much of an air-, sea-, and ground-based patrolling capability is required. Protection for personnel, equipment, and cargo is essential for reducing the effects of CB attack. If APODs and SPODs are without overhead cover for exposed equipment and cargo, planners might consider taking measures to construct covered areas to reduce the degree of contamination following a CB attack. Sacrificial covers may be a less expensive alternative that achieves the same degree of protection.

While it is anticipated that soldiers and civilians will be outfitted with protective gear, collective protection facilities are often overlooked. While there are numerous options available, collective protection equipment is of no use unless it is set up and put into operation long before it is needed. Collective protection provides an over-pressure environment where soldiers and civilians can work in reduced mission oriented protective posture (MOPP) despite contamination outside. This is critical to sustaining command

POD CB Threat Mitigation and Post-Attack Recovery Planning

MITIGATION

Method	Task	Source
TBMD/ABTD	Asset Protection – 1 Battery	Army Patriot/PAC 3, THAAD, Navy Aegis
Physical Security	Interdiction/Early Warning of Air, Ground and Sea-based CB threats	Military Police, Shore Patrol, US Coast Guard, Navy, Air Force, Host Nation law enforcement
Protection	Individual/collective protection for all exposed personnel, equipment, cargo	U.S. supply system, Host Nation, Commercial sources
Dispersion	Expand APOD/SPOD or base cluster footprint to reduce target effectiveness	Pre-deployment planning and coordination with Host Nation government
Concealment	Reduce enemy observation capability through use of terrain and smoke	US Army Smoke platoon; aggressive patrols
Redundancy	2-Deep Capabilities	Coordinate multiple PODs with Host Nation; Increase deployment troop list
Deployment Planning	Maximize use of Host Nation; prioritize force requirements for troop list	Pre-deployment planning and coordination with Host Nation, based upon continuing POD CB defense shortfalls
TPFDD Planning	Economize/maximize strategic lift assets through prioritization	Based upon continuing POD CB defense shortfalls

POST-ATTACK RECOVERY

Unit	Mission	Capability	Mission Resources	Units Per POD
Army Decon Platoon (M12 or M17)	Detailed Equipment Decon	52 Major vehicles/day	Water–400 gal/veh STB–1-50lb drum/day DS2–125 gallons/day	2
Army Decon Platoon (M12 or M17)	Detailed Troop Decon	150 soldiers per day	Water-3000 gal/10 troops STB-1-50lb drum/day DS2-50 gallons/day	2
Army Decon Platoon (M12 or M17)	Terrain or Facility Decon	1-2 Sq KM per day	Water-3000 gal/day STB-26-50lb drum/day M2 Anti-set – 13lbs/day Anti-foam – 24oz/day	2
Army NBC Recon Platoon (M93 FOX)	Area, Route Point Survey Monitor, Detection	24hr coverage of APOD, SPOD	Organic equipment (6 FOX Systems)	1
Army BIO Detection (BIDs) Platoon (M31E1)	Area, Route Point Survey Monitor, Detection	24hr coverage of APOD, SPOD	Organic equipment (7 BIDs Systems)	1

Augmentation

USAF - APOD
PRIME BEEF
RED HORSE

USMC - SPOD
CBIRF

USN - SPOD
NCFSU
NMCB

USA - PODs
Military Police
Engineer
Tech Escort
EOD
QM Supply
Med Det.

Medical support is programmed into the POD medical support plan. Coordination must ensure a capability for treatment of chemical casualties at on-site facilities prior to transfer to a higher level of care or subsequent evacuation from theater.

Figure 33.

and control, medical treatment operations, feeding, and temporary relief from MOPP. Dispersion and concealment are methods to reduce both the effects of enemy attack and

his ability to target the critical port mission functions. A single U.S. Army smoke platoon can aid in concealment by its capability to provide smoke coverage over an area up to one kilometer wide by several kilometers long depending on weather conditions.[3]

The second half of figure 33 discusses the units needed for post-attack recovery. Each POD will have the requirement for equipment, personnel, terrain, and facility decontamination; chemical reconnaissance; biological agent detection; and medical support. Since the units debarking into the ports have no organic combat-ready NBC defense or medical capability, those services must be provided for them. Equipment, troop, and terrain decontamination are missions that can not be conducted simultaneously by any one platoon. Separate platoons must be detailed for each mission. In the event that twenty-four-hour decontamination operations are required, it is advisable to have a second platoon available. The decontamination capabilities shown in figure 33 are fairly robust with one platoon able to decontaminate fifty-two major vehicles or 150 soldiers or 1 to 2 square kilometers of terrain per day.[4] Two platoons are recommended to achieve either of these decontamination capabilities at an APOD or SPOD. A more formidable CB threat or a more vulnerable port environment may necessitate additional units for a potentially heavier mission load. The single largest decontamination resource needed is water. The quantities of water, Super Tropical Bleach (STB), Decontamination Solution 2 (DS2), anti-foam, and anti-set reflect the requirements to achieve the decontamination capability cited in figure 33.[5] Both the chemical reconnaissance and the biological detection platoons are organized with multiple systems for decentralized, continuous operations. While both the FOX and BIDs platoons will employ systems in pairs, one platoon is adequate to provide twenty-four-hour coverage at any APOD or SPOD.

The medical support plan for the joint rear area (JRA) must include the contingency for chemical and biological casualties. Since there is no accurate vulnerability assessment for personnel in a port environment, casualty estimation becomes difficult. However, if proper mitigation measures are in place, personnel are well trained and are in any level of MOPP, casualty estimates for one chemical missile attack in a port can be expected to be less than half of the 21 percent expected in a battlefield environment for unwarned, unprotected personnel.[6] Since the APOD or SPOD has a large targetable footprint, combat support hospitals (CSH) supporting those PODs can decrease their vulnerability by locating outside of those base clusters. However, intermediate medical support facilities must be established within the POD base cluster to prepare CB casualties for evacuation to higher-level facilities.

The mitigation recommendations described above illustrate the importance of threat analysis and vulnerability assessment. Earlier, figure 31 discussed how baseline enemy CB capability helps planners determine baseline mitigation and post-attack recovery requirements. Filling those requirements is determined by conducting an analysis of host nation capabilities and then identifying remaining CB defense shortfalls that must be filled by the U.S. military. Figures 32 and 33 provided a detailed look at the type and level of CB threat mitigation and post-attack recovery measures needed for the PODs both before and during U.S. deployment to theater. The final step in this process is to construct an executable consequence management plan for the PODs.

Consequence Management Planning and Execution Conclusions

The vague planning guidance offered in doctrinal publications leaves APODs and SPODs largely unable to deal with the consequences of a CB attack from any range of threat and, therefore, places U.S. national strategy in grave danger. Port CB defense planning and consequence management execution are deliberate operations, yet they are not examined at the strategic or operational levels nor are they defined as missions in terms of task, condition, standard. There are no linkages between range of threat capability and required U.S. CB defensive depth. Active defense measures are deliberately omitted from discussion, there is no incorporation of functional branch doctrine (e.g., Transportation Corps), and there is no consideration as to the effect of environmental or port maturity on defense and consequence management plans.

Consequence Management Planning and Execution Recommendations

Achieving the fixed site defense goals of sustained protection, command and control, and combat support depends upon the execution of mitigation measures and the emplacement of post-attack recovery assets before a CB attack occurs. As commander in chief (CINC) staff planners prepare contingency plans within their area of responsibility (AOR), the CB defense of the APODs and SPODs prior to force projection begins with an analysis of POD options within the JRA. An overview of this analysis, depicted at figure 34, helps planners determine which APODs and SPODs are available to support the projection of military forces into the theater. The mitigation and post-attack recovery

recommendations discussed earlier establish the CB defense and consequence management needs that can now be refined and tailored to the JRA.

Using the 1990-1991 Gulf War as an example, figure 34 indicates there can be multiple POD options for the CINC to choose from as he determines how to best support the overall strategy. Now armed with the previously discussed mitigation and post-attack response recommendations, planners have a fairly solid assessment of the resources needed to ensure the preservation of a POD from enemy CB attack. Once the PODs have been selected, the CINC staff begins the task of coordinating host nation CB threat mitigation and post-attack response measures for each of the selected ports. It is at this

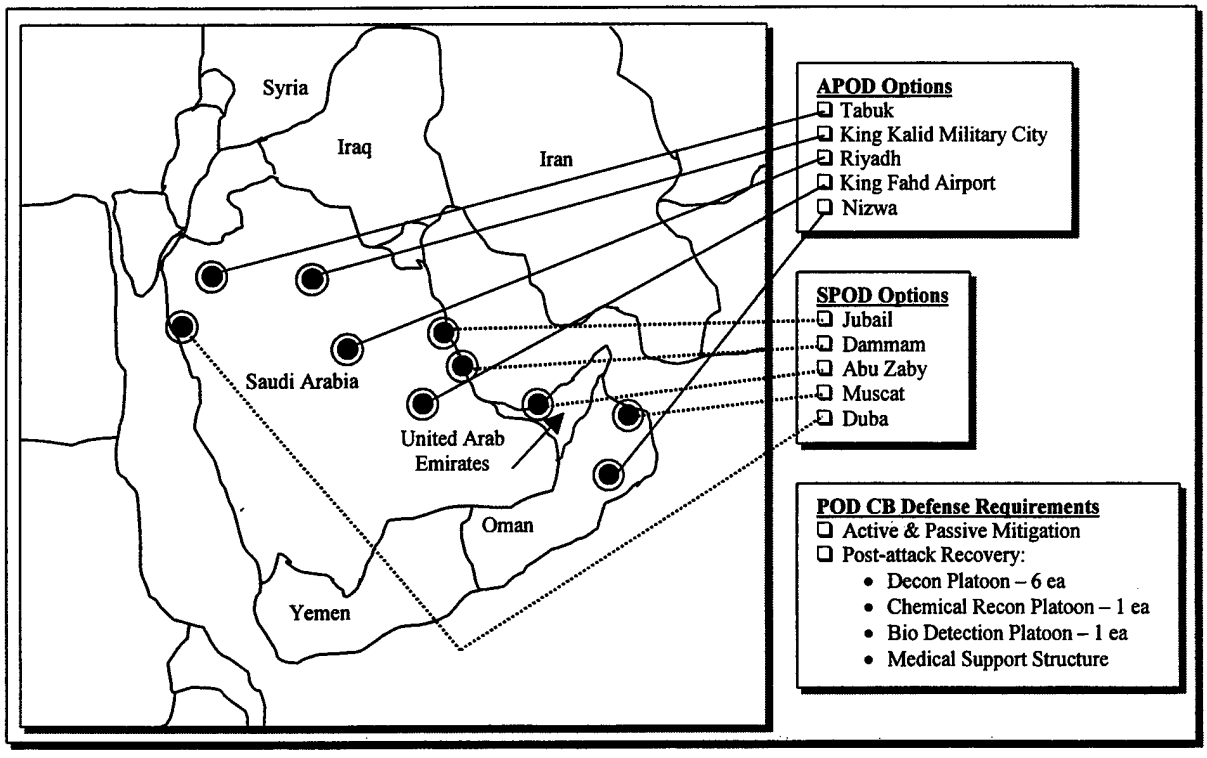

Figure 34. JRA Port of Debarkation Option Analysis

point that the enemy CB COA must be analyzed to determine if CB threat mitigation and post-attack response measures can be emplaced to meet a potential enemy strike.

Superimposing the enemy course of action time lines over the timed activation of port CB defensive measures will allow planners to visualize the shortfalls. This allows CINC planners to implement strategic or operational changes necessary to buttress port CB defenses in advance of force-projection operations. During and continuing through force projection operations, CB defense mission assignments are revised based upon the arrival of additional assets previously programmed for the port CB defense mission. Figure 35 is a notional enemy timeline that will illustrate how CB defense planning and consequence management procedures must overlay the enemy course of action. Referring to figure 35, if today is D-9, U.S. military planners have seen the preceding events and, with the aid of satellite imagery, are beginning to foresee the movement of Iraqi forces toward the Kuwaiti border. Numerous other indicators allowed planners to develop the enemy course of action depicted in figure 35. Fearing a major Iraqi offensive, U.S. planners select primary and alternate PODs throughout the Arabian Peninsula to support the rapid projection of military forces into theater. Once the PODs have been selected, assets from the host nation and any forward deployed forces are assembled for the immediate, expedient CB defense of the PODs as illustrated earlier in figure 32, Host Nation Mitigation and Post-Attack Recovery Options.

Postulating that the enemy will employ CB weapons, U.S. planners realize the pressing need to have active CB defenses in place at the PODs prior to any attack. Symptoms of mass illness appearing at D-2 are indicative of a biological attack occurring at D-5. In figure 35, the star with a number one at D-5 represents a decision point that

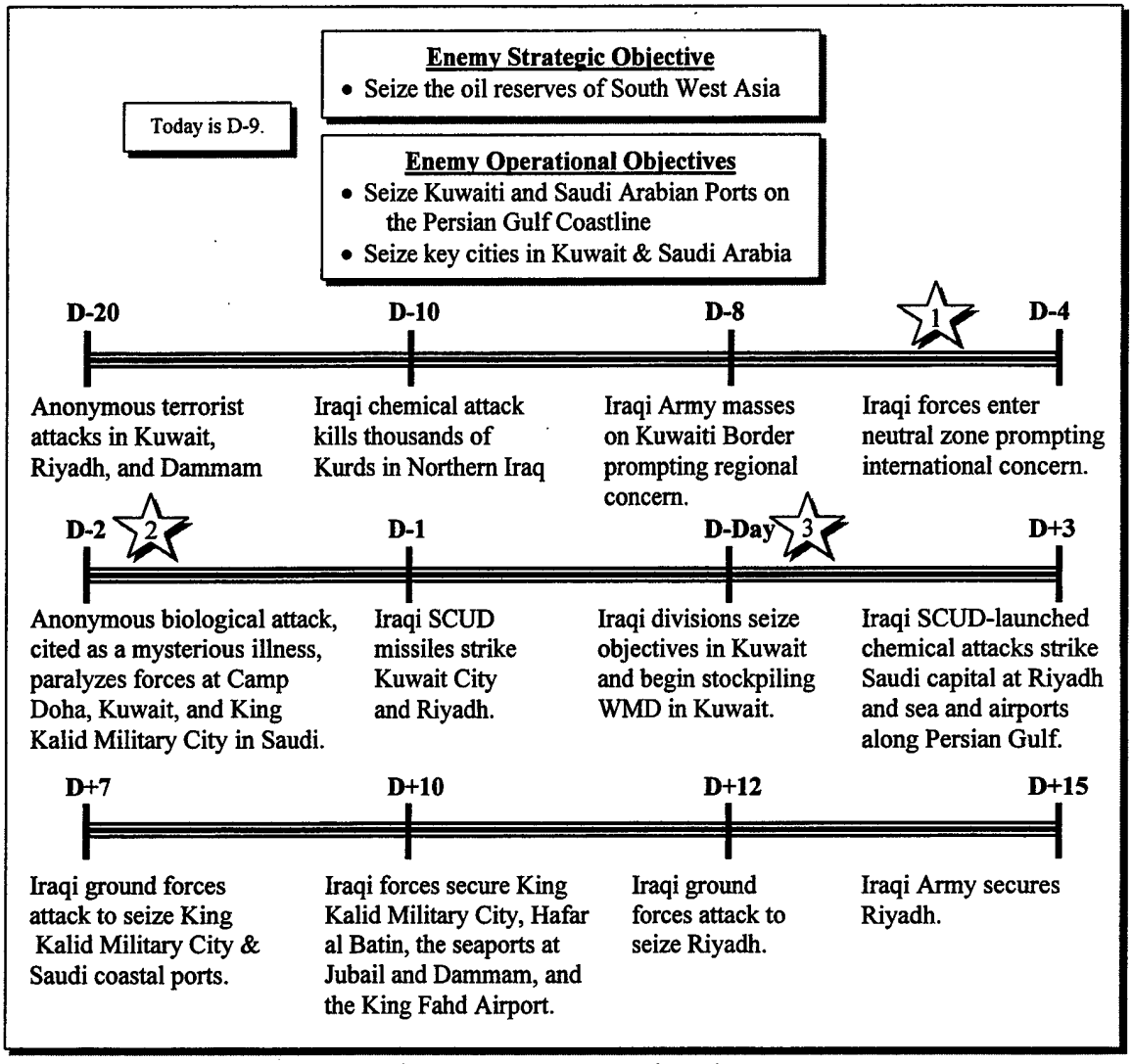

Figure 35. Enemy COA Time Line

indicates a CB defense and consequence management capability is needed at this time in order to be prepared for projected upcoming enemy CB strikes. If SCUD missiles begin to fall at D-1 with CB-weaponized versions landing at D+3, sometime prior to D-1 is when an air defense capability must be in place. Prior to D+3 is when there must be a chemical attack consequence management capability in place should a CB SCUD attack be successful.

This quick analysis helps planners determine what CB defense and consequence management capabilities must be emplaced and when. This analysis also reveals any capability shortfalls. If there are any outstanding mitigation and post-attack response requirements, planners will have to determine what rapid response options exist within the U.S. military force structure and then recommend inclusion of those assets into the deployment plan with early TPFDD slating. Its important to remember that early entry force packages are constructed to meet the highest priority threats and establish conditions for the introduction of follow-on forces. NBC staff planners must articulate to the commander the potential strategic and operational effects of not being able to fill CB defense and consequence management requirements with in-theater assets. If the threat is serious enough to bring U.S. force projection to a halt, then the argument must be made to include those CB defense capabilities as part of the early entry force.

As theater forces continue to build and the original enemy time line is disrupted, the CB threat remains. As units slated for POD defense arrive in theater, the JRAC must now grapple with the challenge of rapidly constructing a cohesive and functional CB defense and consequence management plan. The discussion that follows recommends solutions for command and control, integration of mitigation measures, and finally, the consequence management procedures necessary to recover from a CB attack on a POD. This discussion will build upon the JRA CB Defense Responsibilities described in figure 27 and will also address the considerations for mitigating and responding to the first, second, and third order effects illustrated in tables 4 and 5 and figures 28 through 33.

Figure 36, Command and Control for APOD and SPOD CB Defense, delineates key responsibilities from the CINC J3 NBC through the JRAC, supporting NBC defense

units, base cluster (APOD, SPOD) commanders, base commanders, and transient and tenant unit commanders. The CINC J3 NBC staff has overall responsibility for conducting the CB threat analysis, vulnerability assessment, vulnerability mitigation and CB defense and consequence management plans. It is this staff that forms the policies that integrate host nation, joint, and multinational forces.

The JRAC is primarily responsible for strategic and operational active and passive CB threat mitigation measures. It is up to the JRAC to establish and enforce the guidelines for tactical active and passive mitigation to ensure uniform implementation throughout the JRA. Figure 37 is a graphic portrayal of the JRAC's strategic and operational mitigation measures in support of APOD and SPOD commander's CB defense operations. Key enablers of POD CB defense are the JRAC's implementation of air defense coverage, coastal security, and air patrols. In addition to ensuring the APODs and SPODs are resourced to implement active and passive mitigation, the JRAC will also provide area medical support which can become critical in the event of a CB attack.

The base cluster (APOD or SPOD) commander employs similar mitigation measures as does the JRAC but with a tactical orientation. Within the limits of terrain and facilities, the APOD or SPOD commander designates alternate critical mission function areas in an effort to provide redundancy or reduce enemy targeting effectiveness. To further conceal POD operations, the JRAC may task organize a chemical smoke generator platoon to the base cluster commander. Figure 38 illustrates the implementation of mitigation measures applicable to the base cluster and base commander. The most notable difference between the JRAC and the base cluster is that the POD commander does not control air defenses or air and sea patrols. Some of the CB

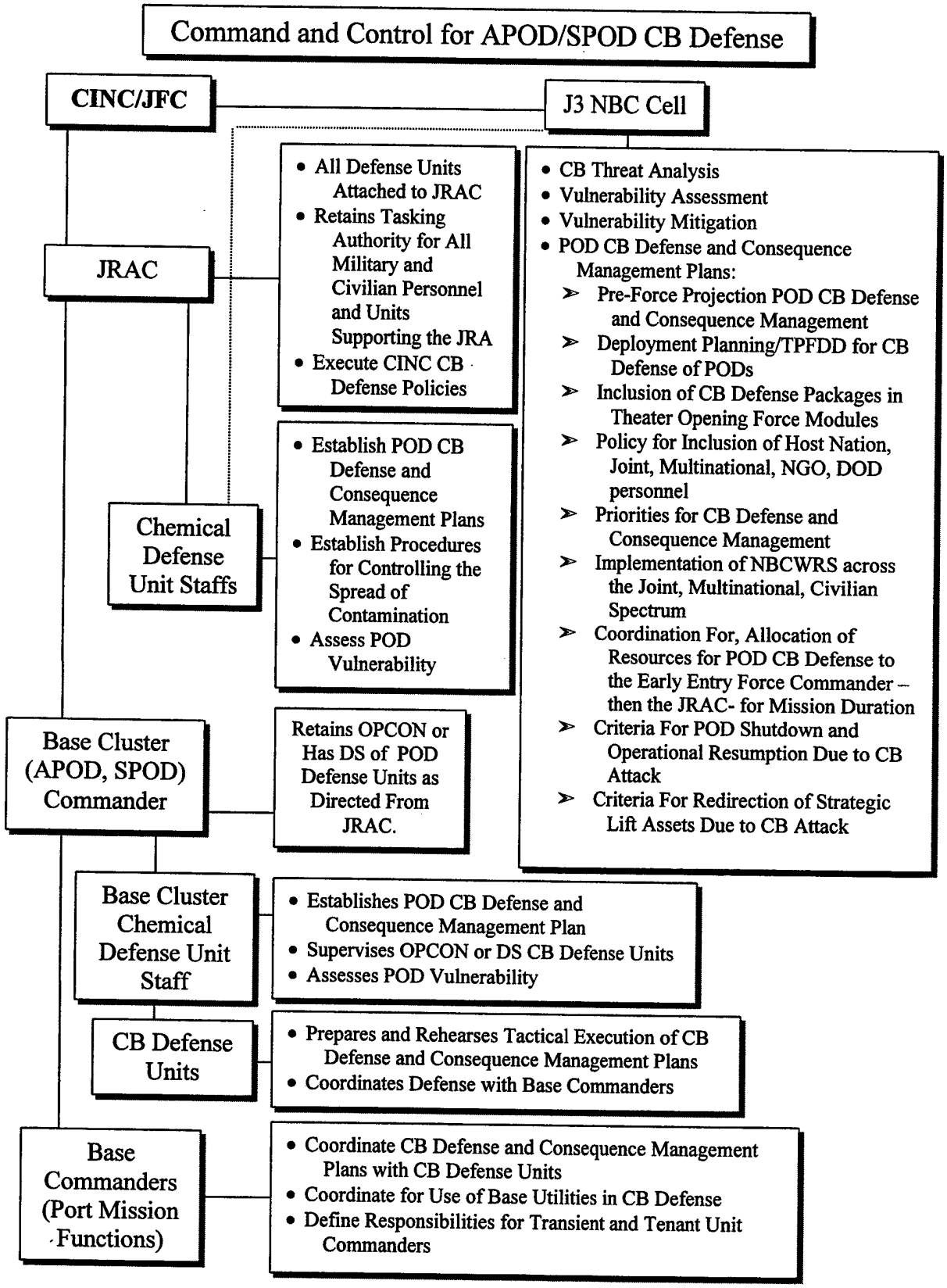
Command and Control for APOD/SPOD CB Defense
CINC/JFC
J3 NBC Cell
JRAC
• All Defense Units Attached to JRAC
• Retains Tasking Authority for All Military and Civilian Personnel and Units Supporting the JRA
• Execute CINC CB Defense Policies
• CB Threat Analysis
• Vulnerability Assessment
• Vulnerability Mitigation
• POD CB Defense and Consequence Management Plans:
➢ Pre-Force Projection POD CB Defense and Consequence Management
➢ Deployment Planning/TPFDD for CB Defense of PODs
➢ Inclusion of CB Defense Packages in Theater Opening Force Modules
➢ Policy for Inclusion of Host Nation, Joint, Multinational, NGO, DOD personnel
➢ Priorities for CB Defense and Consequence Management
➢ Implementation of NBCWRS across the Joint, Multinational, Civilian Spectrum
➢ Coordination For, Allocation of Resources for POD CB Defense to the Early Entry Force Commander – then the JRAC- for Mission Duration
➢ Criteria For POD Shutdown and Operational Resumption Due to CB Attack
➢ Criteria For Redirection of Strategic Lift Assets Due to CB Attack
Chemical Defense Unit Staffs
• Establish POD CB Defense and Consequence Management Plans
• Establish Procedures for Controlling the Spread of Contamination
• Assess POD Vulnerability
Base Cluster (APOD, SPOD) Commander
Retains OPCON or Has DS of POD Defense Units as Directed From JRAC.
Base Cluster Chemical Defense Unit Staff
• Establishes POD CB Defense and Consequence Management Plan
• Supervises OPCON or DS CB Defense Units
• Assesses POD Vulnerability
CB Defense Units
• Prepares and Rehearses Tactical Execution of CB Defense and Consequence Management Plans
• Coordinates Defense with Base Commanders
Base Commanders (Port Mission Functions)
• Coordinate CB Defense and Consequence Management Plans with CB Defense Units
• Coordinate for Use of Base Utilities in CB Defense
• Define Responsibilities for Transient and Tenant Unit Commanders

Figure 36.

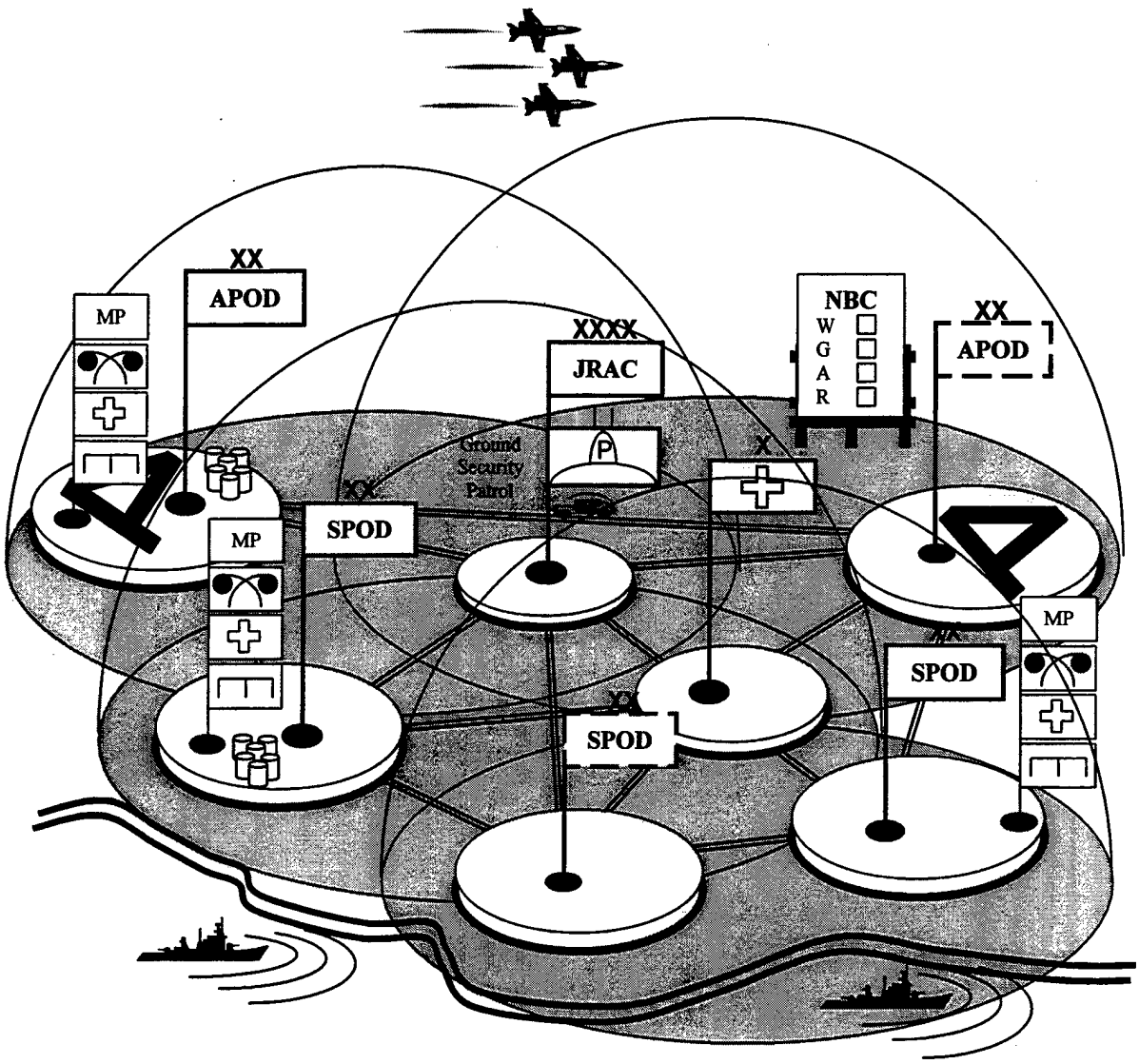

Figure 37.

threat mitigation measures include perimeter security and controlled access, internal physical security and traffic control, and collective protection for mission critical functions. Base commanders are responsible for implementing passive chemical

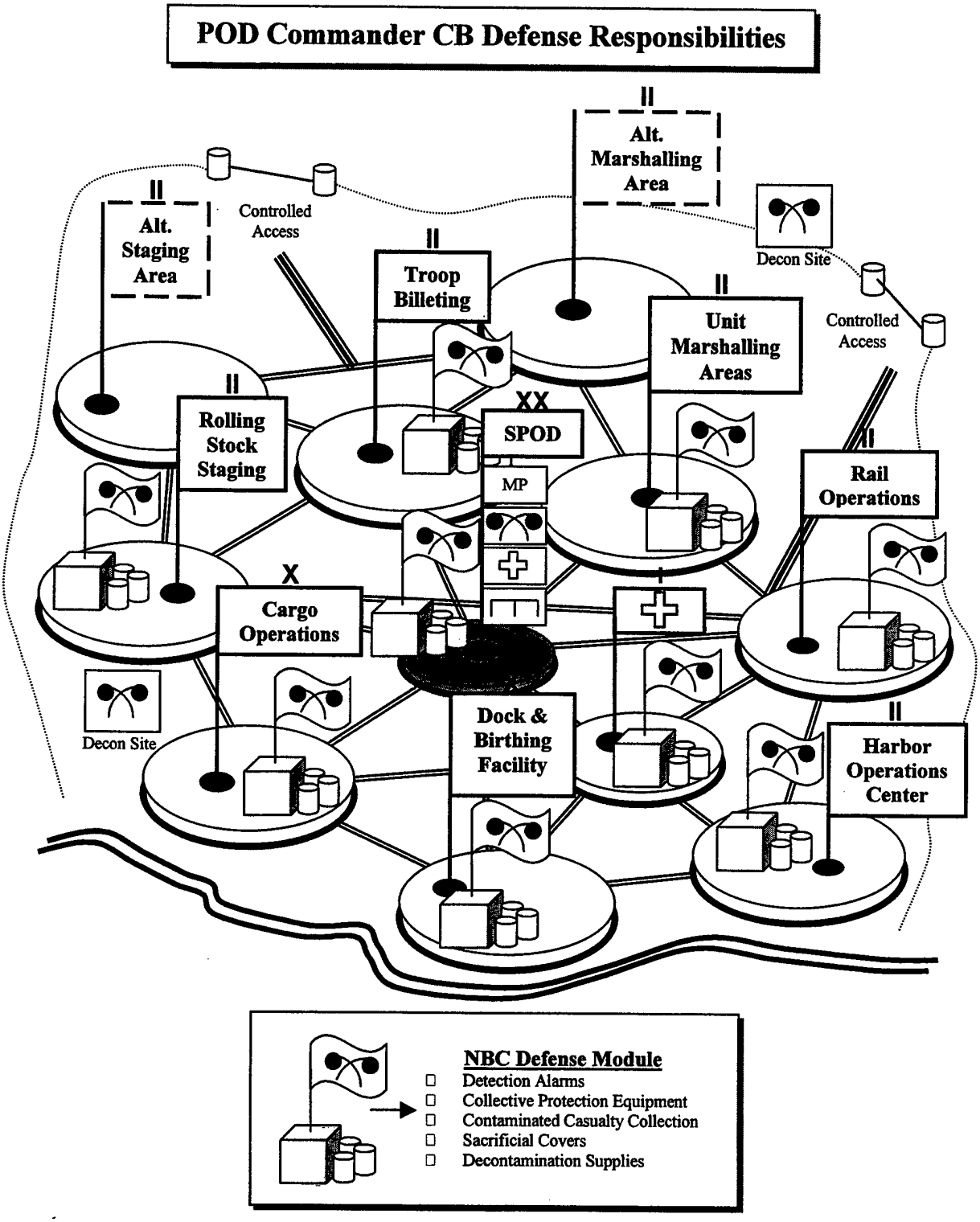
POD Commander CB Defense Responsibilities
II
Alt. Marshalling Area
II
Alt. Staging Area
Controlled Access
II
Troop Billeting
Decon Site
II
Unit Marshalling Areas
Controlled Access
II
Rolling Stock Staging
XX
SPOD
MP
II
Rail Operations
X
Cargo Operations
Decon Site
Dock & Birthing Facility
II
Harbor Operations Center
NBC Defense Module
Detection Alarms
Collective Protection Equipment
Contaminated Casualty Collection
Sacrificial Covers
Decontamination Supplies

Figure 38.

detection, coordinating chemical casualty collection, and providing covers or covered areas to protect exposed personnel and equipment from the effects of chemical attack.

Despite all efforts to mitigate vulnerabilities and emplace seemingly airtight CB defenses, an enemy CB attack can still occur. The only question is, Will it occur before or after U.S. forces begin debarking at the port? In the recommendations that follow, both situations will be addressed but the majority of the discussion is devoted to the circumstance involving U.S. presence. The reason for this is based upon an assumption that if enemy forces overwhelm a POD from a CB attack, U.S. forces will eliminate that port from the list of entry options and pursue an alternate strategy.

For the sake of problem solving, the situation must predicate that the U.S. has deployed early entry forces into a POD that is largely under the control of the host nation. Before any U.S. military CB defense units arrive in theater, to include a theater opening force module (TOFM) CB defense packages, the enemy CB attack occurs. If the CINC staff had conducted advance planning, the early entry force commander may have had time to assemble and organize the assets listed earlier in figure 32, Host Nation Mitigation and Post-Attack Recovery Options. In any event, host nation assets will have to be mobilized for the CB attack recovery and figure 32 lists the primary assets needed.

Early entry forces must begin the coordination for host nation port CB defense prior to or immediately upon arrival. The first issue to be worked out is command and control. Figure 39 recommends a host nation coordination structure. While it may resemble a typical command and control wiring diagram, the emphasis is on the coordination with the host nation's representatives who retain command of the recovery

assets. In this situation, the U.S. ambassador becomes the central figure for pulling resources together. His relationships with host nation government officials and

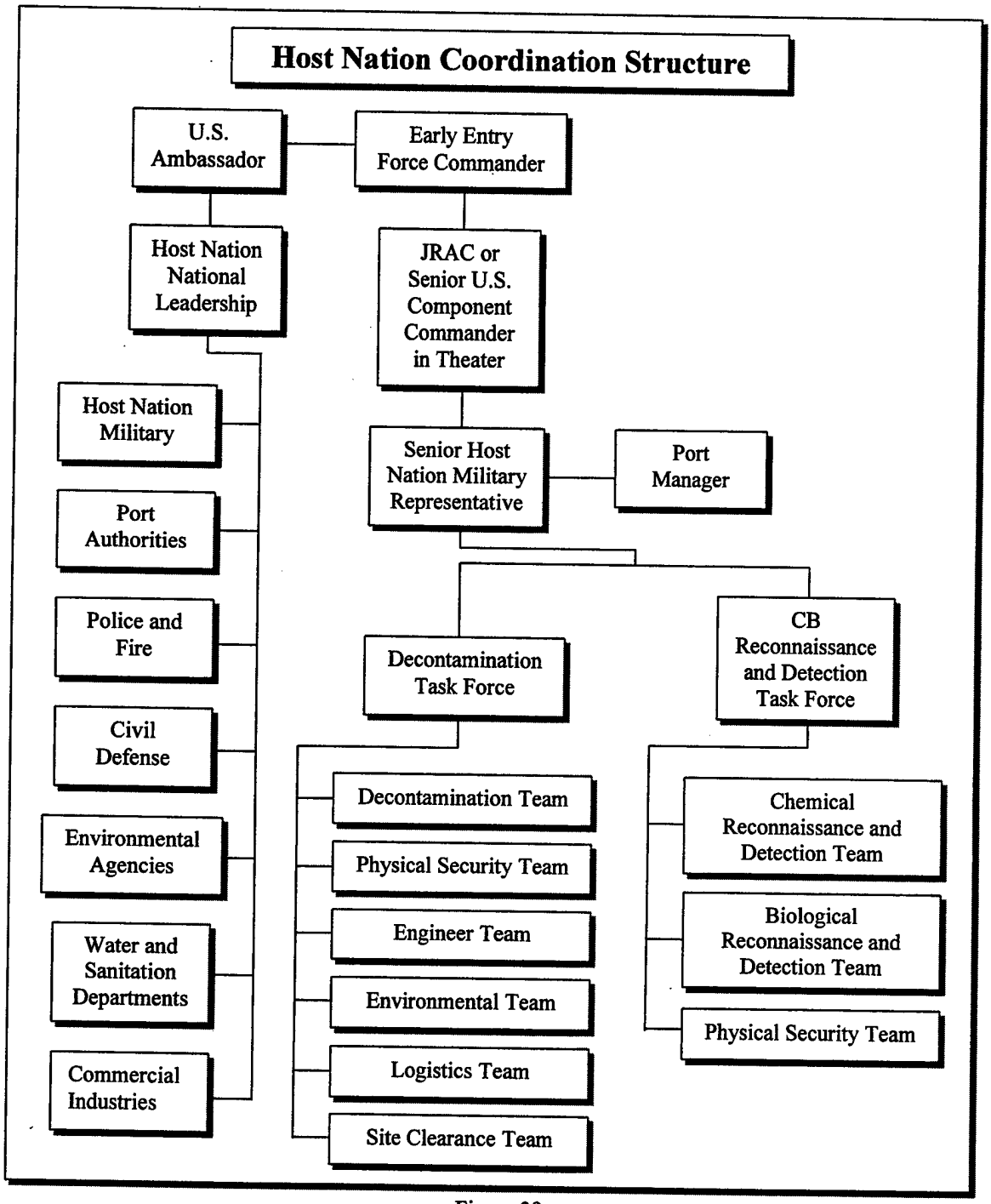

Figure 39.

industry leaders enable him to coordinate and receive immediate support. Without the U.S. ambassador, the early entry force commander will have a difficult if not impossible task of coordinating resources to execute the type of decontamination necessary to support the continued flow of U.S. and allied military forces into theater.

Once the coordination structure is working, the issue transitions to equipment functionality. The host nation military must be the first source for decontamination and detection equipment and personnel. Whatever the host nation military cannot provide must be resourced from the host nation governmental and commercial agencies. Fire-fighting equipment may be organic to mature port environments and could function extremely well for high-pressure washing. However, it is likely that this equipment will not be able to mix and spray decontaminants. In that case, decontaminants may need to be mixed and applied by hand or sprayed on with equipment that is capable of dispensing a heavy decontaminant solution. Such equipment may be found within the agricultural or industrial manufacturing sectors.

Water is the largest consumable resource in a decontamination operation. Knowing the locations of hydrants, standpipes, pumping stations, water lines, and storage tanks is essential for successful execution of the decontamination mission. Local civil authorities may be the best source for bulk water storage and transportation as well as expedient decontaminant supplies. Clearing the decontamination site may be the most critical phase since the resumption of force flow into theater is dependent upon the total neutralization of the hazard. If the host nation military lacks a detection capability, local law enforcement, civil defense, or environmental agencies may have equipment that can do the job.

Given the austere conditions postulated in this example, it becomes obvious that, in a theater where the U.S. exercises strong policies of engagement, a CB defense and recovery plan must be deliberately emplaced before force projection operations begin. This can be accomplished by either organizing and training host nation personnel, outfitting them with U.S. detection and decontamination equipment, or a combination of both. In the end, there must be a guarantee that a CB defense and recovery capability will be in place to support force projection operations.

While this was a relatively short summary, the discussion that follows offers extensive detail for consequence management as executed by U.S. forces once they have arrived with the appropriate capabilities. It is predicated upon the in-place infrastructures depicted in figures 37 and 38. The discussion can serve to offer insight on how to cope in situations of limited host nation capability borne out of a situation of little or no previous theater engagement. When a CB attack occurs on a port with U.S. forces possessing a response capability, the POD chemical defense unit staff must rapidly implement consequence management plans.

Figure 40 illustrates how consequence management can be subdivided into phases. Phase I, Security and Protection Operations, begins with the detection of a CB attack. Chemical attacks can come in the form of missile, bomb, aircraft spray, or covert, unconventional attack. The sudden activation of passive chemical or biological detection alarms may be the only indication of an attack. Immediately upon the activation of detection alarms, individual and collective protection systems must be put in use POD-wide. Additionally, the POD commander should consider activating the tactical combat force (TCF) to prevent attempts by the enemy to rapidly exploit the effects of the attack.

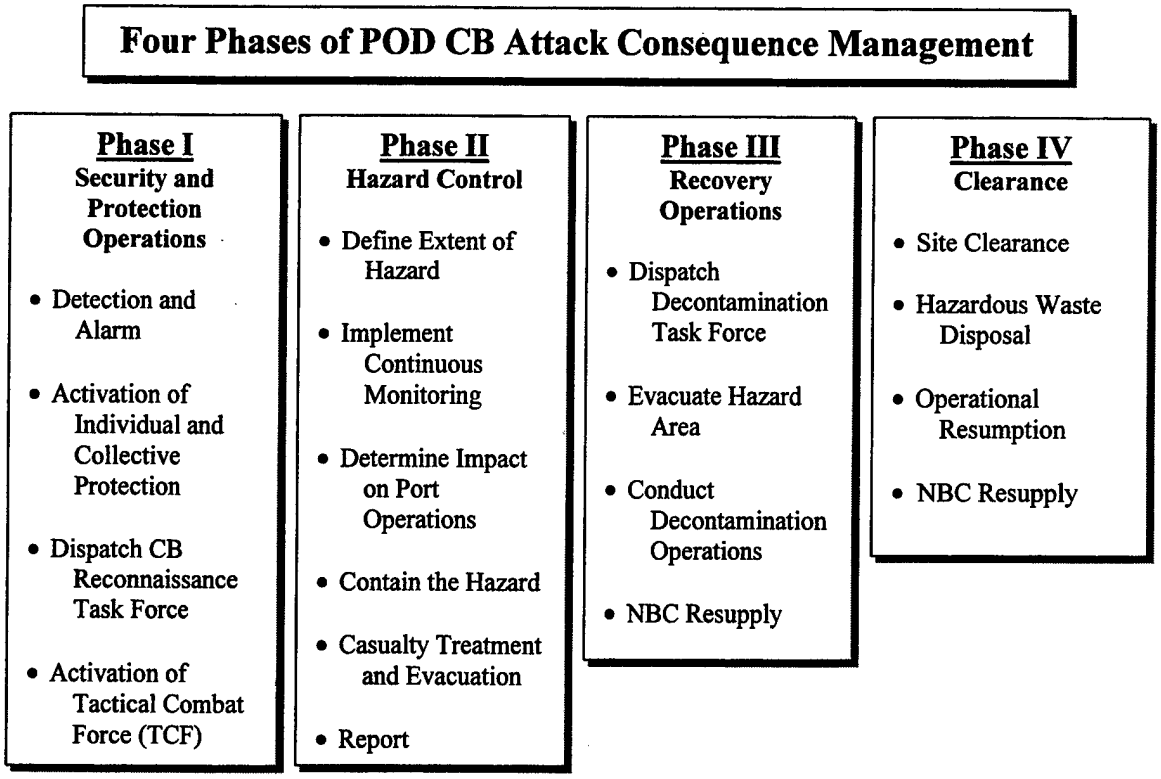

Figure 40.

Phase II, Hazard Control, begins as soon as all security and protection systems have been implemented at 100 percent. Determining the extent of the hazard is completed through the evaluation of data gathered by chemical and biological detection units (FOX, BIDs). The CB detection units must identify both vapor and liquid contamination. It is critical that the point of attack be identified so that the source of the hazard can be contained. The detection units mark the area and implement continuous monitoring. The POD chemical defense unit staff receives the data from the detection units and dispatches military police to the attack area to conduct circulation control operations. Additionally, the POD chemical defense unit staff continues to analyze initial and follow-up reports in order to determine the extent of contamination.

Base commanders implement active CB detection within their own areas and treat casualties as required. Base commanders must be prepared to execute CB casualty decontamination and MOPP gear exchange without assistance. Reports from the base commander to the POD commander are essential for cost-effective dispatch of limited medical and recovery assets. As soon as the POD staff completes its rapid, initial hazard assessment, it must report evaluated data to all subordinate units, the neighboring community, and the JRAC. The POD commander will determine if critical mission function areas need to be shut down or relocated to a previously designated alternate site. The JRAC will warn or divert all inbound strategic lift and commercial shipping assets as necessary. As the POD staff completes downwind hazard predictions, chemical and biological detection assets are repositioned accordingly for continuous monitoring of contamination levels.

Phase III, Recovery Operations, begins when all initial CB attack effects have been received and prioritized by the POD staff. In the event there are multiple attacks, the employment of limited decontamination assets will have to be prioritized. In the event of an overwhelming CB attack, the JRAC must consider augmenting the POD's recovery capability with assets from other PODs. The POD chemical defense unit staff dispatches the decontamination task force. Decontamination contingencies are developed based upon POD capabilities and should be structured to facilitate rapid response. There are a number of ways to accomplish this. If decontamination units are plentiful, each unit can be directed to respond to a specific mission, such as detailed troop decontamination, thorough equipment decontamination, terrain decontamination, or facility decontamination. If assets are limited, they may be charged to conduct any of those

missions within a specific sector of the POD. In the case of a very austere capability, missions will be directed under strict adherence to established priorities.

The ideal nucleus of a decontamination task force is a U.S. Army decontamination platoon or company. Additional capabilities, such as those cited in figure 33, are to be included as necessary. Chemical decontamination requires intensive logistic and personnel support. The decontamination task force will need to make on-site assessments to determine the requirements for additional support. Uncontaminated personnel, equipment, and supplies should be evacuated from the site prior to the start of decontamination operations. Base commanders must be prepared to fill recovery operation taskings directed by the POD commander. As a matter of standard operating procedure, base commanders must provide liaison personnel to the decontamination task force conducting recovery operations within his area.

Phase IV, Clearance Operations, begins when all thorough decontamination operations, including terrain and facility, have been completed. The decontamination task force has responsibility for the containment of contamination run-off and for all other hazardous waste generated at the decontamination site. If possible, all contamination should be neutralized on site. If that is not possible, copious amounts of STB should be applied to affected materials and then transported to a predesignated, isolated and secure dump site for burial.

Movement of contaminated waste demands strict control. The participation of host nation officials is essential in coordinating the move and reducing risk to the civilian population. Chemical or biological detection assets will continue to monitor contamination levels downwind, at the attack area, the decontamination site and, if used,

the disposal site. Equipment that transports, loads, and unloads contaminated waste will undergo decontamination at the disposal site. Earth-moving equipment used in terrain recovery will undergo decontamination on site. The "all clear" is issued by the POD commander when chemical or biological detection assets indicate it is safe. The completion of the recovery and the all clear is reported to all subordinate units, the neighboring community, and the JRAC. In the event the POD was shut down by the JRAC during the recovery, the JRAC is the one to authorize operational resumption. Thus the recovery process is complete.

Areas for Further Research

There were several topics mentioned at the outset of this chapter that posed related dilemmas. While this thesis focused on the CB defense and consequence management of ports of debarkation, the *CB 2010 Study* postulates significant vulnerabilities potentially facing the ports of embarkation in the U.S. The U.S. possesses such extensive resources within local and federal law enforcement that CB defense options may not require a robust military lead. Secondly, like the APODs and SPODs, the Military Prepositioned Ship (MPS) anchorages and Army Prepositioned Afloat (APA) assets are equally, if not more, vulnerable to enemy CB attack. Neither possess any capability for CB defense or consequence management. This can be a tremendous risk for a nation dependent upon a force-projection strategy.

Vulnerability analysis was a noted weakness in chapter 4 of this thesis. The doctrinal procedures in place today were designed for use in tactical battlefield environments under conditions that do not equate to those found in a port environment.

Additionally, those procedures offer no consideration to joint and multinational forces. An effective process must be developed that can produce a quantitative effect analysis of a CB attack on a POD during various stages of force projection. Related to vulnerability is consequence management. This thesis focused on strategic and operational consequence management. Current NBC doctrine proposes what could potentially be a very ineffectual tactical decontamination procedure for airfields. There are no procedures for decontamination of docks and births for ships. Adequate techniques for these unique decontamination missions need to be developed to reduce the amount of uncertainty that would accompany such a mission today.

The JRAC has responsibility for more than just PODs. Within the JRA is an extensive combat service support (CSS) infrastructure facing the same threat probabilities as the PODs. Given the fact that large CSS facilities are relatively immobile and generally devoid of senior chemical personnel, additional study must be undertaken to determine how to best employ the capabilities of these units for effective rear-area CB defense and consequence management. Lastly, with the ever-increasing proliferation of weapons of mass destruction, chemical defense force structure needs to be examined to determine if the assets exist to meet the wide range of CB threats. Preparing elaborate and detailed procedures for CB defense and consequence management of PODs is of little value if the force structure is not and will not be capable of executing the mission.

Thesis Summary

As a power projection military today, the U.S. bases the success of any strategy on its ability to deploy combat forces in rapid fashion to hot spots throughout the world.

Operations DESERT SHIELD and DESERT STORM showed the world what the U.S. and allied forces could do given six months to flow combat power into ports completely unopposed. The ensuing air campaign set out to deliberately destroy Saddam Hussein's WMD capability before he could effectively employ it against coalition forces. The *CB 2010 Study* concluded that the U.S. will not have that same luxury in the future.[7] Rampant proliferation of WMD today among some of the United States' most probable foes coupled with the verified early use of chemical weapons in past recent conflicts are compelling reasons for the U.S. to develop port CB defense and consequence management strategies now. While senior military analysts believe that the U.S. can prevail militarily after suffering a CB strike on the ports of debarkation during force projection, the cost of such an event will be a prolonged conflict with significant casualties.[8]

This thesis addressed what needed to be done now to avoid paying such a price. An enemy CB attack on a strategic port of debarkation during the force projection process presents an immediate, long-standing lethal situation far too complex to overcome without significant advance preparation. The manifestation of the CB threat can come in many forms and the threat analysis process must be modified to identify each one. Only then can vulnerabilities be accurately assessed and mitigated. The U.S. Army's battlefield-oriented vulnerability assessment process, if applied to port environments, would probably result in a tremendous overestimation of some CB effects while underestimating or failing to address others altogether. This weakness has a direct impact on U.S. forces' ability to defend against and recover from the effects of a port CB attack. With the goal of sustaining U.S. force projection strategy and saving the lives of

servicemen and women, the recommendations proposed in this study state what should be adopted today in order to defend against and recover from a CB attack in the ports of debarkation tomorrow.

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[5]Department of the Army, Field Manual 3-5, *NBC Decontamination* (Washington, DC: U.S. Government Printing Office, 1993), 4-14, 4-16, 5-6, 10-6.

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